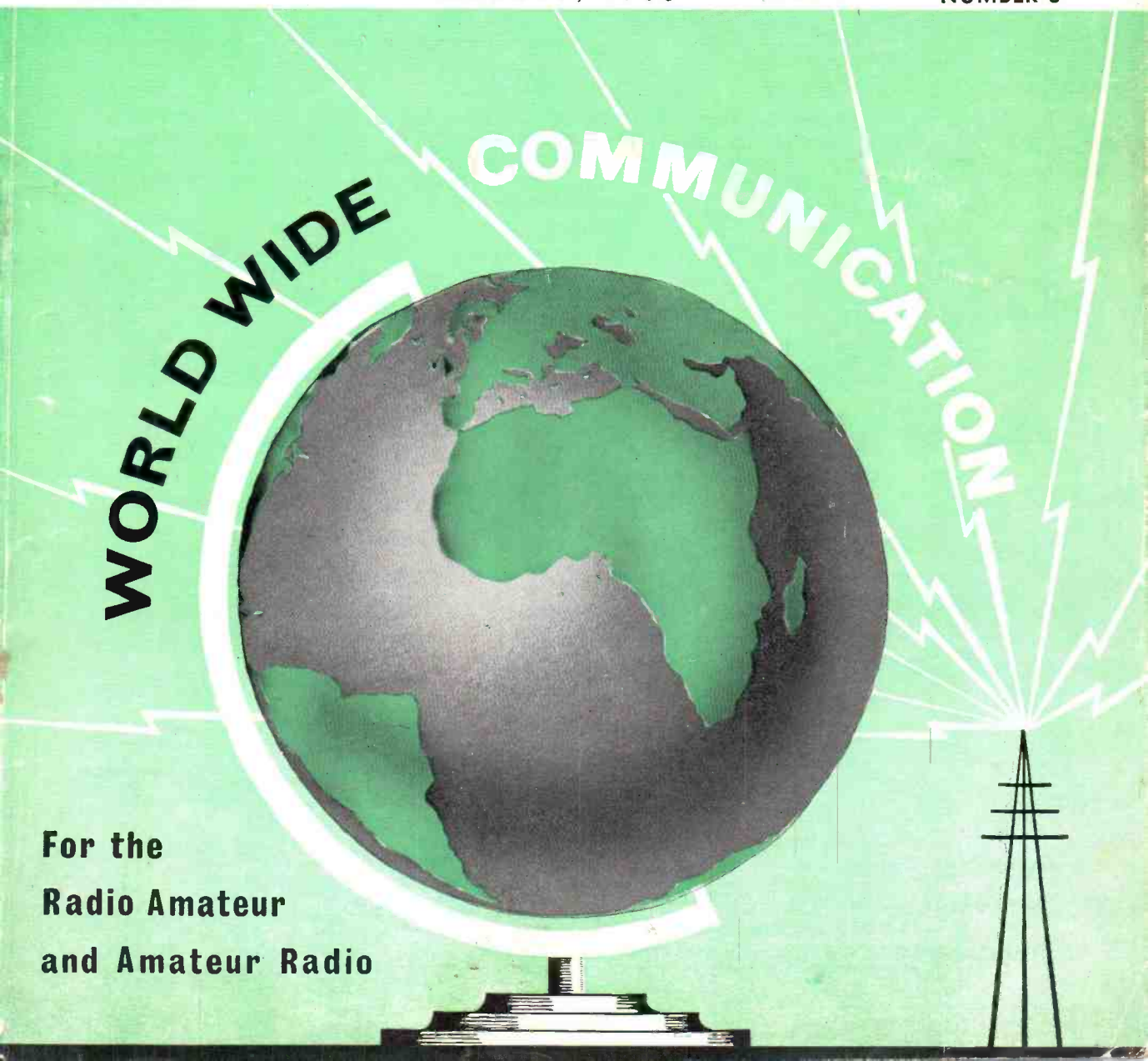
The SHORT WAVE Magazine

2/9

VOL. XVIII AUGUST, 1960 NUMBER 6



For the Radio Amateur and Amateur Radio

Technical Publications

Available from stock

	Post Free
ANTENNA HANDBOOK (*Published by A.R.R.L.*) (8th Edition)	19s. 0d.
A COURSE IN RADIO FUNDAMENTALS (*New Edition*)	10s. 6d.
BASIC AUDIO COURSE	22s. 6d.
BASIC RADIO COURSE	19s. 0d.
BEAM ANTENNA HANDBOOK	22s. 0d.
BETTER SHORTWAVE RECEPTION	24s. 0d.
COMMAND SETS (*Published by CQ.*) Information on conversion of many Command Transmitters and Receivers	12s. 6d.
CQ ANTHOLOGY	16s. 9d.
DXERAMA (*3rd Edition*)	16s. 0d.
DX GUIDE (*New Edition*)	16s. 9d.
GUIDE TO BROADCASTING STATIONS (*Twelfth Edition*) pp.112	3s. 10d.
HAMS INTERPRETER (*Published by OH2SQ*)	7s. 0d.
HIGH FIDELITY (*Gernsback*)	12s. 6d.
HIGH FIDELITY CIRCUIT DESIGN (302 pp.) (*Gernsback*)	48s. 0d.
HINTS AND KINKS, Vol. 5	11s. 0d.
HOW TO BECOME A RADIO AMATEUR★	5s. 0d.
HOW TO LISTEN TO THE WORLD	7s. 0d.
LEARNING THE RADIO TELEGRAPH CODE	4s. 6d.
LOG BOOKS Spiral bound (*Published by A.R.R.L.*)★	7s. 6d.
MOBILE HANDBOOK (*Published by CQ*) (*Second Edition*)	24s. 0d.
MOBILE MANUAL (*Published by A.R.R.L.*)	23s. 0d.
NEW SIDEBAND HANDBOOK (*Published by CQ, latest issue*)	25s. 6d.
NOVICE HANDBOOK	23s. 6d.
OPERATING AN AMATEUR RADIO STATION (*Published by A.R.R.L.*)★	2s. 8d.
QUAD ANTENNAS	23s. 0d.
RADIO AND TV HINTS	8s. 6d.
RADIO DESIGNERS HANDBOOK (*4th Edition*) 1,498 p.p. (*F. Langford Smith*)	50s. 0d.
RADIO VALVE DATA (*Iliffe*)	5s. 9d.
S—9 SIGNALS	8s. 6d.
SCATTER PROPAGATION THEORY AND PRACTICE (*H. W. Sams*)	25s. 0d.
SURPLUS SCHEMATICS (*Published by CQ*)	21s. 0d.
SHORT WAVE RECEIVERS *For The Beginner*	6s. 6d.
SINGLE SIDEBAND FOR THE RADIO AMATEUR (*A.R.R.L.*)	14s. 6d.
SURPLUS CONVERSION MANUAL Volume 1	21s. 0d.
Volume 2	21s. 0d.
Volume 3	21s. 0d.
TELEVISION INTERFERENCE — ITS CAUSES AND CURES	15s. 6d.
THE OSCILLOSCOPE	18s. 6d.
THE RADIO AMATEUR OPERATOR'S HANDBOOK (*Data Publications*)	3s. 6d.
THE RECORDING AND REPRODUCTION OF SOUND (*H. W. Sams*)	64s. 0d.
TRANSISTORS— THEORY AND PRACTICE (*New Edition*) (*Published by Gernsback*)	23s. 0d.
TRANSISTOR THEORY AND PRACTICE (*Published by World Radio Handbook*)	9s. 6d.
TRANSISTOR TECHNIQUES (*Gernsback*)	12s. 6d.
VHF HANDBOOK	24s. 0d.
WORLD RADIO HANDBOOK, 1959 Edition, 180 pages	8s. 6d.
WORLD RADIO HANDBOOK, 1960 Edition, 198 pages	16s. 6d.

(★ *Not strictly applicable under U.K. conditions*)

Latest Issues

New and Greater Edition of the

RADIO HANDBOOK (15th Edition)

Published by *Editors & Engineers*, W6-U.S.A. 800 pages, durable binding.

Price 60s. post free, from stock.

RADIO AMATEUR CALL BOOK

Special Note: In future, the CALL BOOK will be published in two parts: *American* Section only, appearing quarterly, at 41s. 6d. post free; *Foreign* (non-American) Section half-yearly in March and September, at 25s. post free. Will include latest callsign/address listings for all countries, including much DX data. The only complete directory to the radio amateur stations of the world.

American Section Summer Edition, 41s. 6d.; *Foreign* (non-American) Section, Spring Edition (*Reprint*), 25s. **The two together at 60s. post free. Winter Edition** (*American, 6 only*)**—25/- per copy, post free**

THE RADIO AMATEUR'S HANDBOOK

LATEST (1960) EDITION

Published by the American Radio Relay League.

Price (standard binding) **34s. post free**

(*Bound in whole Buckram, de luxe, 44s.*)

DX ZONE MAP Latest Revision

Paper Edition, 9s. 3d. post free

Linen Backed (*de luxe*) **11s. 9d. post free**

ALSO NEW

A map of the world, 34 ins. wide by 21 ins. deep, with zones and country prefixes marked, and including a prefix list and smaller great circle map of the world centred on Europe. Both maps in colour. Published by DL1CU. 7s. 6d. (post free).

MAGAZINES BY SUBSCRIPTION

	One Year
AUDIO	40s. 0d.
*CQ, RADIO AMATEUR'S JOURNAL	44s. 0d.
ELECTRONICS (*Trade only*)	160s. 0d.
POPULAR MECHANICS	32s. 0d.
POPULAR SCIENCE	48s. 0d.
QST, *ARRL*	43s. 0d.
HIGH FIDELITY	56s. 0d.
ELECTRONICS WORLD (*formerly "Radio and Television News"*)	48s. 0d.
RADIO ELECTRONICS	36s. 0d.
SERVICE	24s. 0d.
TELEVISION	48s. 0d.

*Binders for CQ 30s. 0d.

Post free, ordinary mail only

Subscription Service for all American Radio and Technical Periodicals

SHORT WAVE MAGAZINE

Publications Department

55 VICTORIA STREET, LONDON, S.W.1

ABBEY 5341

INDEX TO ADVERTISERS

SHORT WAVE MAGAZINE

Vol. XVIII AUGUST, 1960 No. 202

CONTENTS

Managing Editor: AUSTIN FORSYTH, O.B.E. (G6FO)

Advertisement Manager: M. GREENWOOD

Published on the first Friday of each month at 55 Victoria Street, London, S.W.1. *Telephone: Abbey 5341/2*

Annual Subscription: Home and Overseas 33s. ($5·00 U.S.) post paid.

AUTHORS' MSS

Articles submitted for Editorial consideration must be typed double-spaced with wide margins on one side only of quarto or foolscap sheets, with diagrams shown separately. Photographs should be clearly identified on the back. Payment is made for all material used, and it is a condition of acceptance that full copyright passes to the Short Wave Magazine, Ltd., on publication.

The SHORT WAVE Magazine

EDITORIAL

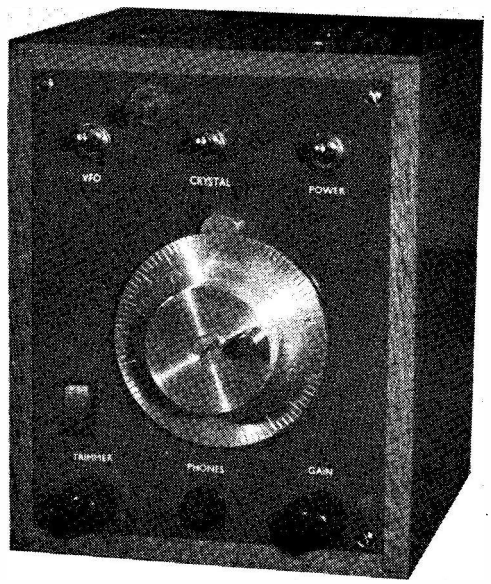
Congo *The grisly happenings in the newest of the " independent " African states have been followed with fascinated horror by the whole civilised world. Whatever the facts may be of the period of anarchy — and the full story will probably never be told — it is beginning to emerge that by no means all the Belgians of the Congo became refugees.*

No radio amateur could fail to be proud of the part played by so many of the 9Q5 members of our fraternity when a situation of extreme peril burst upon them. It was the AT stations in the Congo who — in the tradition of the radio operator on whom others depend for succour, if not for life itself — went on the air for long hours to pass the urgent traffic for their local communities. All normal communications having failed or become unreliable, it was on them that the responsibility fell to bring in help.

It is not yet possible to evaluate fully all that the 9Q5's achieved in the perilous days before the arrival of United Nations troops. That many European and African lives were saved through the medium of Amateur Radio communication there can be no doubt. That the situation would have been far worse if AT stations had not been available, scattered through the great land of the Congo, is certain. That any 9Q5 national will expect to receive any official recognition is most unlikely.

But the Belgian nation, as it counts the appalling cost in the Congo, can at least be proud of what the active 9Q5's were able to do when the test came, and our friends in ON4 can be assured that they have the sympathy and admiration of all radio amateurs in the U.K.

Austin Forsyth G6FO.



The heterodyne frequency meter built by G3LOK — see circuit below and text for notes.

Heterodyne Frequency Meter

FOR THE AMATEUR BANDS

E. St. B. SYDENHAM (G3LOK)

This, and the power pack also described, was part of the author's entry for our recent Home-Built Station Competition.—Editor.

THIS is a miniaturised mains driven heterodyne frequency meter somewhat similar to the BC221 in its circuitry, but arranged to cover the amateur bands only ; the oscillator fundamental tunes from 3·5 mc to 4 mc ; this avoids the necessity for wave change switching, harmonics of the oscillator frequency being used to provide coverage up to 32 mc. The stability is good: the total frequency drift at 3·5 mc checked over a period of three hours' running was found to be 80 c/s.

The crystal oscillator operates at 7 mc and thus gives check points at both ends of the tuning scale.

The chassis and panel are of $\frac{1}{8}$-in. dural plate and the tuning condenser worm drive housing

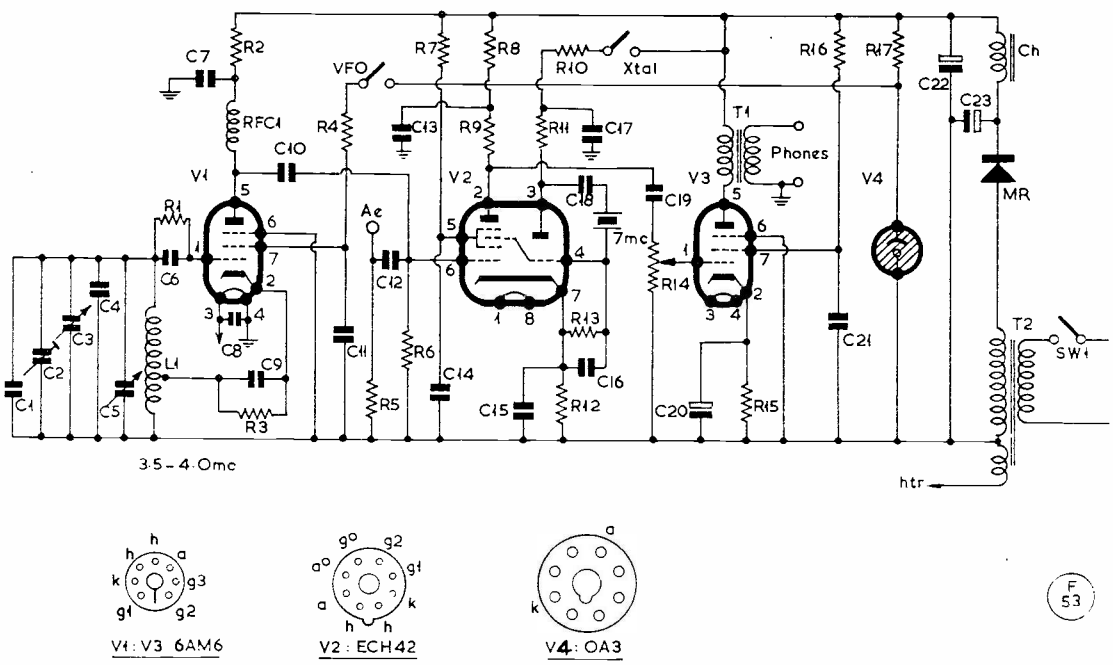


Fig. 1. Circuit of the heterodyne frequency meter designed and built by G3LOK, to cover all amateur bands. The crystal is a band-edge marker and calibrator, and the tuned circuit is over 3.5-4.0 mc only, to give harmonic coverage of the HF bands without switching or coil changing. The instrument is self-powered and stabilised.

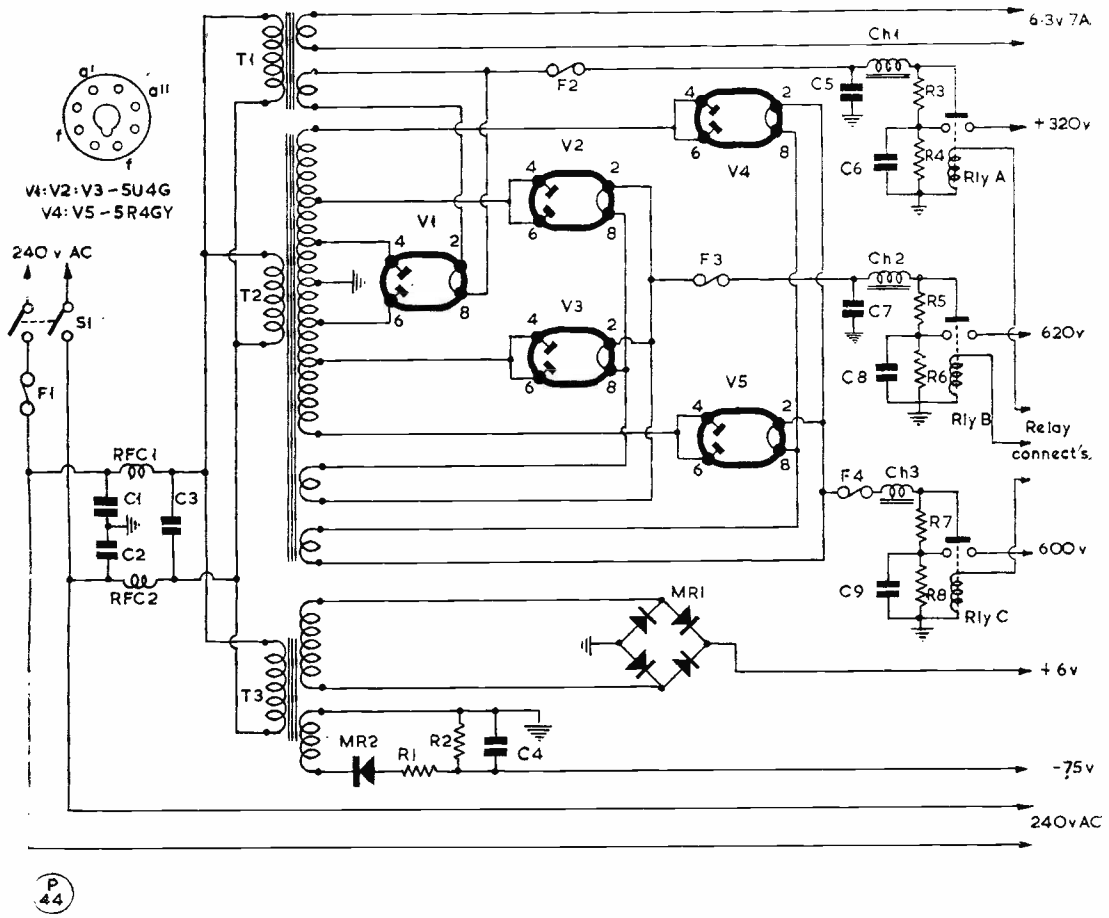


Fig. 2. Interesting power supply unit designed by G3LOK to run the transmitting side of his station. By the use of a large multi-tap power transformer, a variety of HT outputs is obtainable. Separate transformers, home-constructed, are used for heater, bias and relay supplies.

Table of Values

Fig. 1. Frequency Meter designed by G3LOK

C1	75 μμF, silver mica
C2	20 μμF, var.
C3	5 μμF, var.
C4	100 μμF, silver mica
C5	75 μμF, var.
C6	47 μμF
C7, C8, C18, C19	.001 μF
C9	100 μμF
C10	5 μμF
C11, C13, C14, C17	.01 μF
C12	50 μμF
C15, C21	0.1 μF
C16	20 μμF
C20	50 μF
C22	16 μF
C23	8 μF
R1, R11, R13, R16	47,000 ohms
R2, R8	4,700 ohms
R3	470 ohms
R4	33,000 ohms, hi-stab.
R5	2 megohms
R6	1 megohm
R7	39,000 ohms
R9, R10	22,000 ohms
R12	200 ohms
R14	1 megohm, var.
R15	1,000 ohms
R17	15,000 ohms
RFC1	3 mH
L1	To tune 3.5-4.0 mc
MR	Half-wave metal rect.
Ch	10 Hy choke
T1	250v. mains xformer
S1	On-off switch
V1, V3	6AM6
V2	ECH42
V4	OA3

Table of Values

Fig. 2. Power Supply Unit at G3LOK

C1, C2, C3	.01 μF
C4	50 μF
C5, C6, C7, C8	4 μF
C9	8 μF
R1	3,000 ohms, 5w.
R2	10,000 ohms, 2w.
R3	6,000 ohms, 5w.
R4	20,000 ohms, 10w.
R5	10,000 ohms, 5w.
R6	30,000 ohms, 10w.
R7	20,000 ohms, 5w.
R8	50,000 ohms, 10w.
Ch1	15 Henry
Ch.2, Ch.3	10 Henry
S1	SPST switch, toggle
T1	Heater xformer
T2	Multi-tap HT xformer
T3	100v. bias xformer
MR1	FW bridge rect.
MR2	HW metal rect.
RFC1, RFC2	Mains filter chokes
V1, V2, V3	5U4G
V4, V5	5R4GY

(*Note:* Relays A, B, C operated from LV supply on pack.)

forms an integral part of the chassis to give the maximum mechanical stability. The worm drive is spring-loaded to prevent back-lash: the

capacitor spindle and tuning dial spindle are both mounted in ball bearings. The total length of scale is effectively 80 feet.

Power Supply Unit

This is given in Fig. 2. and supplies all HT, LT and control voltages required for the transmitting side at G3LOK. The main transformer is an ex-Admiralty multi-tap type, which gives ample voltage/current output in the circuit shown. With this the pack also contains one heater transformer and one combined 10 volt and 100 volt transformer for the supply of power for the relays and negative bias.

The relays, smoothing chokes and additional transformers were all home made ; the whole unit is built into a chassis made from 1-in. angle iron and is completely enclosed in an expanded metal cover. It is thus impossible to touch any "live" part of the equipment without first removing the cover. The HT outlet socket is completely dead until the plug is inserted ; without the plug the relays cannot operate.

It will be seen from the wiring diagram at Fig. 2 that a special arrangement of bleeder resistance is used in conjunction with double relay contacts ; this prevents any surge of current when the contacts are made or broken by maintaining an almost constant voltage on and off load.

All three of the HT circuits are separately fused at 500 mA each and a 5A fuse is included in the mains supply. Adequate RF filtering is included and the chassis and case are earthed *via* a three-core cable and three-pin plug and also bonded through to the transmitter and receiver by the outer screening braid of the inter-connecting cables.

Multi-Band Transmitter Design

FOR MEDIUM-POWER OPERATION

F. I. R. HUNT (G3LNQ)

This article is based on our contributor's entry for the recent Home-Built Station Competition. —Editor.

THE transmitter at G3LNQ runs a maximum input of 90-95 watts on CW and 65 watts on phone. It is completely self-contained and band-switched and, together with its power supply, is contained in a Wilcox-Gay Type 145 VFO case ; this is 16 ins. deep and 13 ins. high by 8½ ins. wide. With careful mechanical design and layout it has been possible to accommodate the RF section with its PSU in what is in effect a completely screened box. The speech amplifier-modulator is built in a separate matching cabinet which was the power unit for the Type 145 VFO.

A detailed circuit diagram of the transmitter is shown on p.292 *over*. The VFO is an EF91 in the hi-C Hartley circuit, into a 5763 buffer/doubler, with a 6146 as PA. Full input up to the limits mentioned is obtained on all five bands 10-80 metres. Of the Type 145 itself, the only original parts left are its case, the large dial with its associated "rocker" for fine tuning, and the switch assembly, which has been modified to control the PA band-change when the VFO and buffer/doubler are switched from band to band.

The grid of the EF91 VFO is permanently on 80 metres ; output is taken at 40m. for 40-20-15 metre operation, and at 20m. for 10-metre working ; for 80 metres, the whole transmitter is tuned to that band, which does involve rather careful setting up if VFO pulling is to be avoided. In all other respects, the stability and quality of note are excellent and, except perhaps on 10 metres, ample drive is available for the 6146 ; the drive level is controlled by R6 in the circuit, acting on the screen of the 5763.

Switching

A suitably shunted 0-5 mA meter is switched to give buffer stage and PA voltage and current readings, and another meter, scaled 0-150 mA, is kept permanently in the PA plate circuit under operating conditions.

For power control and QRO/QRP working, a switch is provided to cut the PA HT supply. With the key down, the PA grid drive can be adjusted and then, with this switch on "QRP," the PA can be tuned up and loaded to a level which, when the switch is put to "QRO," will ensure that the PA is running at full input. By this procedure, the 6146 PA can never "go over the top." At the "QRP" position, an input of about 16 watts is obtained, suitable for short-haul QSO's as well as for setting up.

The voltage divider network associated with the QRP/QRO switch is built up of 10- and

12-watt resistors, as shown by R10-R16 in the diagram.

It will be seen from the circuit that the need for an RF choke in the 6146 PA has been avoided by the use of a series-fed pi-tank circuit; though this does involve careful insulation, with good condensers and isolated switching, it has proved very satisfactory in practice. The current readings obtained on the dummy load in the ATU indicate a high order of PA efficiency, partly at least contributed to by the design of the PA tank coil L6; this is wound on a 2-in. diameter ribbed ceramic former (ex-TU type) and consists of 12½ turns of 16g. double spaced, the remaining 9½ turns being single-spaced 18g. The 40-metre tap is at the junction of 16g. and 18g. windings, and the 15-20 metre taps to give the best L/C ratio were easily found by experiment; the whole coil L6 is, of course, used for 80 metres.

The station of G3LNQ — ex-ZL2GQ, and now at 5 Hillfield Close, North Harrow, Middlesex — is entirely home-built, including the receiver, which is to a design originally published in "Short Wave Magazine." The G3LNQ transmitter has been selected for discussion in the accompanying article, with some notes on the station generally.

Screening

All heater, HT and relay supply wiring is carried out in screened cable with the outer braiding earthed at many points. The two meters are in metal cans, and are by-passed to earth. The mains filtering is extensive and the filter itself is contained in a screening box (actually an "Oxo" tin, suitably disguised) which has a tight-fitting lid. In addition, each RF section is screened, and separated from the power pack by screening.

Aerial Tuning Unit

This has been built into a metal case which originally contained the "Amplifier Type 3562A," with a new panel and chassis deck added. The ATU itself is based on the GW3LJS design—*see* SHORT WAVE MAGAZINE, October 1958, "A Simple Z-Match"—only the physical dimensions differing somewhat because of the size of cabinet. The Monimatch side of this ATU consists of a length of low-loss 75-ohm coax from which the insulation has been stripped, the two diodes being soldered to suitable points on the outer conductor of the coax; this is floating, except for the centre-tap made through a 470-ohm resistor to earth. A three-section low-pass filter has also been incorporated, sub-chassis.

Modulating Equipment

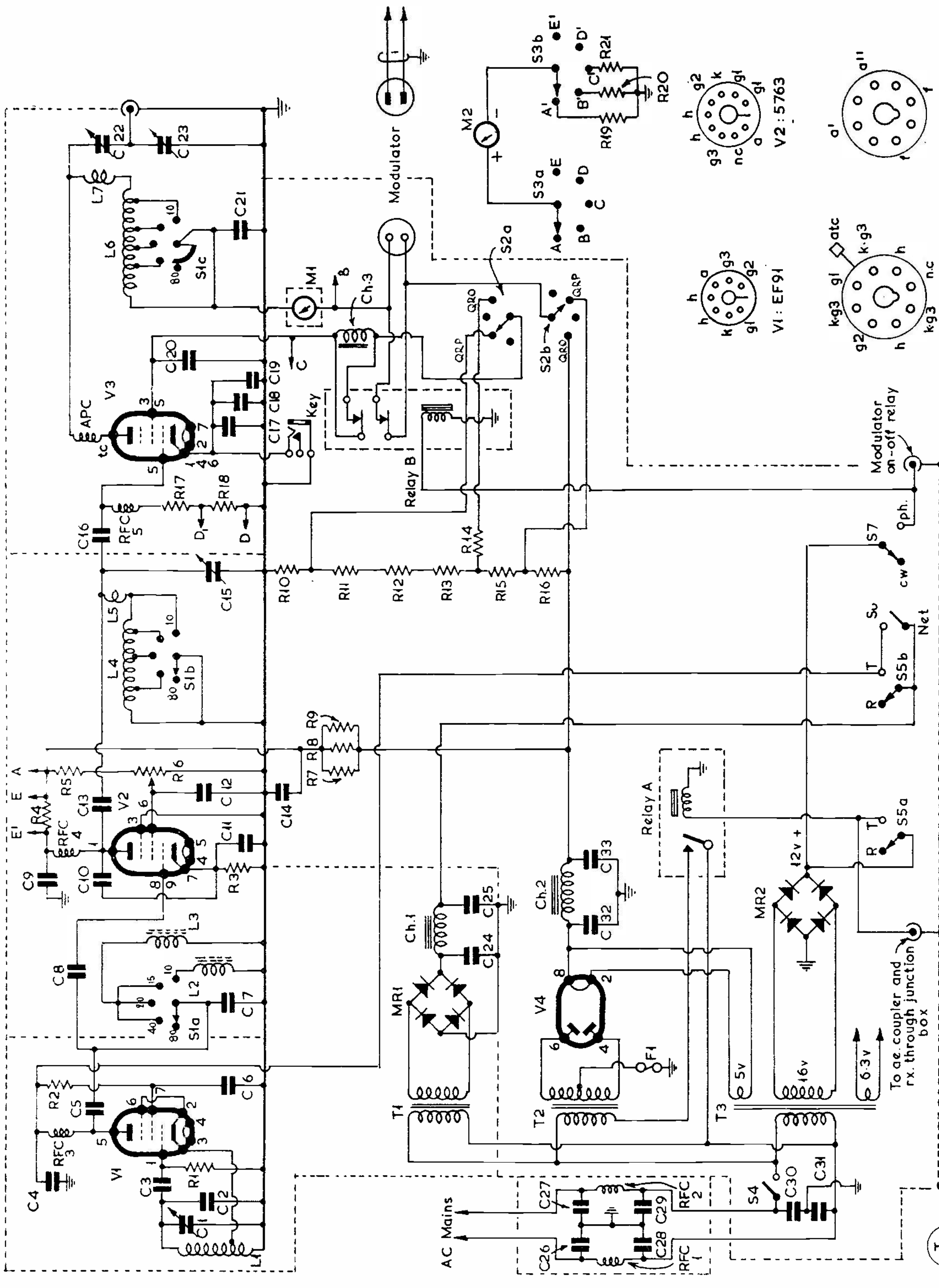
Together with its power supply, the speech amplifier and modulator are built into a metal cabinet 8½ ins. deep and 13 ins. high by 5½ ins. wide.

The speech amplifier is the conventional 12AX7-6C4 arrangement, coupled through a Class-B driver transformer into the grids of a pair of metal 6L6's, which will produce about 30 watts of audio in Class-AB2; this is sufficient to modulate the 6146 PA when running, at 65 watts input. The modulation transformer is a Woden UM1 which, though strictly speaking rather too small for the purpose, takes the +30 watts of audio without distress; reports on speech quality are invariably good on all bands. The modulator HT supply is 400v. only.

It will be seen from the main circuit diagram that on phone a 20 Hy. LF choke is brought into circuit in the screen of the 6146, and the switching is so arranged that the secondary of the modulation transformer is shorted when on CW.

TVI Results

The transmitter is fully TVI-proof on all bands except on 21 mc phone, in regard to which three complaints have been received. Two of these cases were cured by inserting a high-pass filter in the aerial lead to the TV receiver —*see* SHORT WAVE MAGAZINE, February 1959.


Modulator
Modulator on-off relay
To ae. coupler and rx. through junction box
AC Mains
Relay A
Relay B
Key
APC
V1 : EF91
V2 : 5763
V3 : 6146
V4 : 5U4G
M1
M2
S1a
S1b
S1c
S2a
S2b
S3a
S3b
S4
S5a
S5b
S7
QRO
QRP
Net
cw
ph.
MR1
MR2
Ch.1
Ch.2
Ch.3
T1
T2
T3
F1
5v
16v
6·3v
12v +

T 298

Table of Values

Circuit of the G3LNQ CW/Phone Transmitter

C1	150 $\mu\mu$F	C22	250 $\mu\mu$F var.	RFC1,
C2	500 $\mu\mu$F with	C23	.001 μF var.	RFC2
	2 $\mu\mu$F neg. coeff	C32	2 μF	RFC3,
C3, C8,		C33	4 μF	RFC4,
C13, C16	100 $\mu\mu$F	R1	47,000 ohms	RFC5
C4, C6,		R2, R10,		APC
C9, C11,		R11	30,000 ohms	
C12, C17,		R3	220 ohms	
C18, C19,		R4	Meter shunt	T1
C20	.001 μF	R5	10,000 ohms, 1w.	T2
C5	50 $\mu\mu$F	R6	50,000 - ohm 4w.	T3
C7, C10,	10 $\mu\mu$F		var. drive control	
C14, C24,		R7, R8,		F1
C25	8 μF	R9	30,000 ohms, 10w.	M1
C15	100 $\mu\mu$F var.	R12, R13	5,000 ohms	M2
C21, C26,		R14	1,500 ohms	MR1
C27, C28,		R15	25,000 ohms	
C29, C30,		R16	10,000 ohms	MR2
C31	.01 μF	R17	27,000 ohms	S1
		R18	100 ohms	S2
		R19	100,000 ohms	S3
		R20	200,000 ohms	S4, S6,
		R21	50,000 ohms	S7
				S5
		Ch.1,		V1
		Ch.3	20 Henry	V2
		Ch.2	10 Henry, mod.	V3
			choke	V4

Mains filter chokes
2.5 mH
6t., 18g., enam., $\frac{1}{4}$-in. diam., by $\frac{3}{4}$-in. long
0-220v. sec.
750-0-750v. sec.
5v., 6.3v., 16v. secs.
250 mA fuse
0-150 mA FSD
0-5 mA FSD
Contact cooled FW bridge rect.
FW bridge rect.
3-pole, 5-way
2-pole, 4-way
2-pole, 5-way
SPST, toggle
2-pole, 2-way
EF91
5763
6146
5U4G

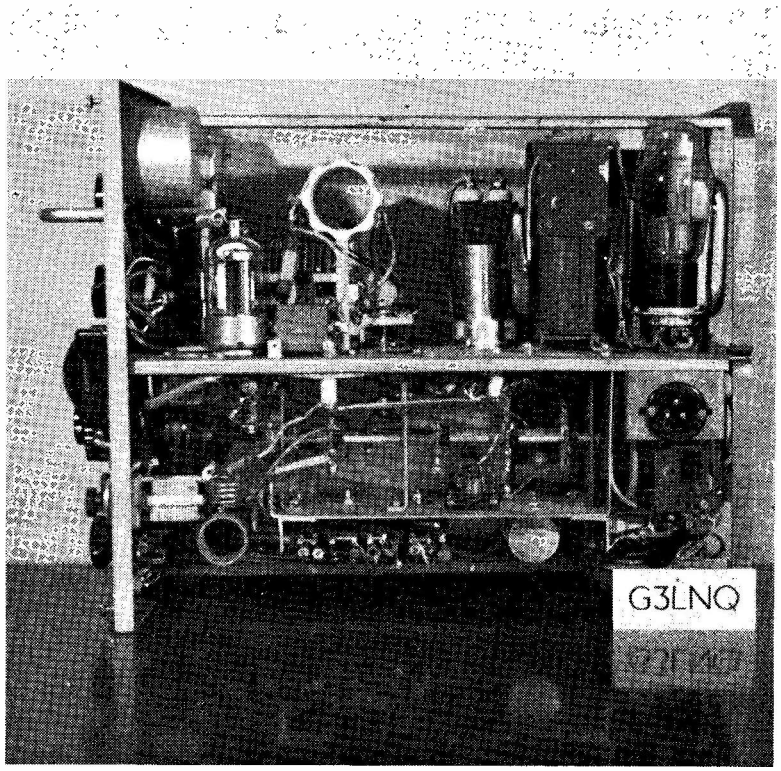
COIL VALUES FOR G3LNQ TRANSMITTER

L1 = 24 turns of 26g. on $\frac{3}{8}$-in. diameter former.
L2 = 19 turns of 26g. on $\frac{3}{8}$-in. diameter former.
L3 = 40 turns of 32g. on $\frac{3}{8}$-in. diameter former.
L4 = 31 turns of 20g. on 1-in. diameter former.
L5 = 4 turns of 18g. on $\frac{3}{4}$-in. diameter former.
L6 = 22 turns on 2-in. diameter ceramic former — *see text*.
L7 = $7\frac{1}{2}$ turns 16g. wound to diameter of $\frac{3}{4}$-in.

"Simple TVI Filter"—and the third was still under investigation at the time of writing. As stated, however, on all other bands the transmitter is clear of TVI when used with an ordinary ATU and no low-pass filter; the LPF *is* necessary to ensure TVI-free operation on 21 mc CW.

As regards DX worked, since G3LNQ became operational in May 1958 with the equipment as described here, 110 countries have been accounted for, mainly on the 14 and 21 mc bands. During the months June-September last year, a daily schedule was kept with ZL2GH on 20 metres, with scarcely a miss except by mutual arrangement; indeed, when G3LNQ went on holiday, the entire station as shown here was put in the back of the car and from a /A location in Somerset, the ZL2GH schedule was picked up again the morning after arrival, using a 20-metre dipole. With the Cubical Quad now in use at the home QTH, consistent weekly schedules have been kept with ZL stations on 21 mc CW and phone; the only failures have been when the band went completely dead.

And, finally, it might be added that G3LNQ uses an entirely home-built receiver—this is a 14-valve double superhet, with crystal-controlled front end, to the design by G2WI in the May-June, 1956, issues of SHORT WAVE MAGAZINE. To this general design, G3LNQ



Side view of the G3LNQ transmitter, seen from the PA end; this is a 6146, and the circuit diagram and text give full details. The transmitter and its power supply complete are built into a Type 145 VFO cabinet, and runs up to 90w. on CW on all bands 80-10 metres.

has applied some modifications of his own, notably a 6BA6 in the RF stage; a single crystal for the 28 mc band (involving a second switched IF range for the full 2 mc coverage); and an S-meter operated by a 6C4 in the AVC line. The frequency stability of this receiver on all amateur bands is quite extraordinary in comparison with any tuned first-oscillator type—the drift from cold on the 15 mc WWV signal is imperceptible, and it has been possible to calibrate the receiver accurately through all bands; this calibration is of BC-221 standard because of the first oscillators being crystal controlled.

MAKING THE GEAR LOOK BETTER

SOME IDEAS AND SUGGESTIONS

D. Pratt (G3KEP) and **D. Noble (G3MAW)**

THE aim of almost every amateur constructor is to make his equipment look as smart and as neat as possible. Some people are successful, but others try, in vain, to make their equipment appear as if it were commercially made. The purpose of this article is to suggest a few ways in which the appearance of home-built equipment can be enhanced. Not only is it hoped that this article will prove useful to readers building equipment from scratch, but several of the ideas suggested will, of course, apply equally to improving the look of surplus apparatus in order to soften that all-too-obvious "ex-Government" appearance.

The factors which determine the smartness of the equipment can be roughly defined under the following headings: Chassis; Cabinet and Front Panel; Scales and Dials; Controls; Labelling; and External Fittings.

Chassis

Before work is commenced on a chassis, a suitable component layout should be worked out on a piece of paper the same size as the proposed chassis before the metal is cut or drilled. If this is done, it will be less likely that holes will appear in the wrong places, and the components will fit together more neatly.

If the equipment is to be built into a cabinet, it is not necessary to get a surface finish on the chassis. If, however, a cabinet is not used, it is desirable to give the chassis itself some treatment. This can be done either by polishing or by giving it a matt finish. A matt finish can be obtained on aluminium by dipping it in a solution of caustic soda and water until a matt appearance results. An alternative, and somewhat easier, method is to drop a little oil on the surface, and then rub over it with a circular motion, using steel wool. After the required finish is obtained, the surplus oil should be wiped off with a soft rag. An even better appearance may be obtained by having the chassis black-crackle or silver-hammer finished. The advantage with this type of finish (which is a professional job) is that it is less susceptible to finger marks.

Cabinet and Front Panel

It is always important to give some attention to the front panel, both as regards layout and surface finish. The panel can be painted, or a matt finish produced as already described. A pleasing effect is often obtained by giving the cabinet and front panel contrasting finishes. For example, one could have a silver-hammer front panel and a black-crackled cabinet. If the equipment is fitted into a cabinet or carried in a rack, it is desirable to provide handles so that it may be withdrawn without risk of strain on control spindles. A simple hinged lid is useful, as it enables valves to be replaced without removal of the equipment from the cabinet.

Scales and Dials

On most items of radio equipment it is necessary to have dial scales on one or more of the controls, in order that the settings may be repeated. On a receiver, for example, it is essential to have a good dial for the main tuning control. Several types of slow-motion dials are available (Eddystone, Bulgin, Jackson, Muirhead), the choice being governed chiefly by the application of the dial and by the type of equipment on which it is to be used, having regard to the appearance of the dial with respect to the other fittings on the panel.

It is often an advantage to put smaller dials on rotary switches, volume controls and similar variables. Once again, there are several types of dial which may be used. If the controls are in line, a very smart appearance is given by drawing the required scales in Indian ink on a piece of tracing paper from which a black-and-white "photostat" print can be taken. A piece of 1/16in. perspex cut to the same size as the scales can then be used to hold them in position. (Tracing paper is suggested because any smudges or errors can be easily erased with a razor blade without affecting the quality of the print.) Also, if a print is taken, the surface will be free from any irregularities caused by the ink on the paper. This same method may be used for calibration graphs and charts.

When a dial covers several ranges—as it may in the case of a Grid Dip Oscillator, for example—it may be an advantage to fix the scale and have a circular dial with hair-lines affixed to the control knob.

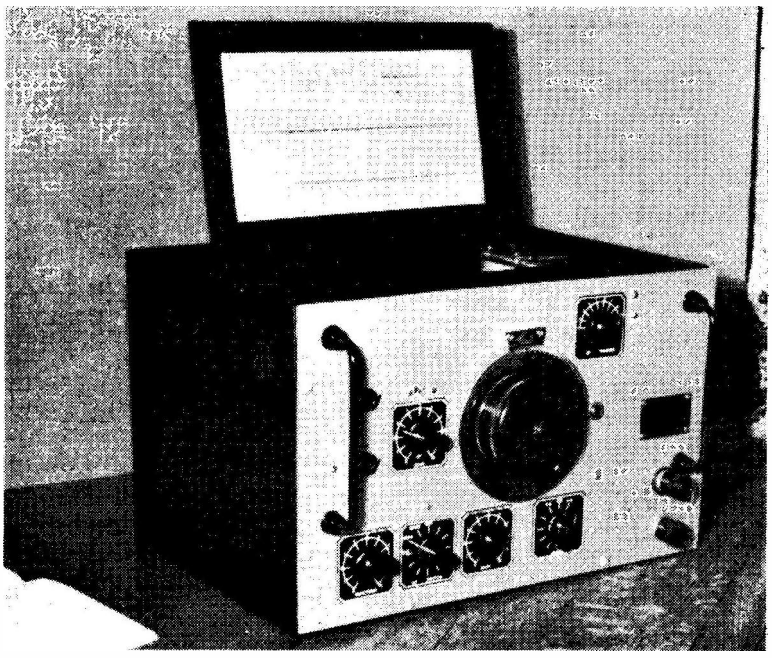
A very pleasing effect can be achieved by the use of small dials in the form of transfers, such as the "Panel-Sign" marketed by Data Publications Ltd. These consist of white printing on a black background,

and are suitable for almost any application.

Control Knobs

When deciding on control knobs, it is a good thing to arrange for them to be all of the same sort. It is true that while one type of knob may be suitable for a particular piece of apparatus, it may not do for another. The trend is to use a circular pointer knob (such as the Bulgin K370) for audio equipment, while on gear on which there are rotary switches which are important in the operation of the equipment, *e.g.*, the range switch of a receiver, a Bulgin K107 small instrument pointer knob is better because the pointer is more prominent.

The popular fluted instrument knob is very useful because it is available in several sizes, and this type is used to a great extent on oscilloscopes and other items of test gear. This type of knob often has three tapped holes in the rear, so enabling a pointer or dial to be fitted if desired.



Example of a piece of equipment — actually an R.1224A receiver — modified as to appearance in accordance with the principles discussed in the text. It differs greatly from its original form. The front panel is silver-hammer finished and fitted with ex-TU unit handles; modern jacks, knobs and dials replace the Service type, and are provided with indicating scales. The cabinet is black-crackled and to its hinged lid is clamped the calibration chart, under a perspex cover.

Control Labels

When a constructor has completed a piece of gear, as he himself knows the purpose of each control, he is often inclined to leave the controls unlabelled. Since in this article we are concerned about the finished appearance, it is important that all controls be properly marked. There are, of course, a few exceptions to the rule—for example, possibly one would not label the main tuning control of a receiver, as its purpose is obvious.

The most effective way of labelling controls is to have the panel engraved. Alternatively, small engraved labels can be made to order by any engraving firm in, say, "Traffolite," which consists of a black-white-black sandwich arrangement of bakelite; this can be engraved so that the central white material is visible.

Engraving, although extremely effective, is expensive. A substitute for this is the use, again, of "Panel-Signs" transfers. Sets of these can be obtained with all types of lettering that may be required for radio equipment. These transfers are available in black or in white, the choice of colour being governed by the shade of the panel on which they are to be used.

Additional Fittings

As mentioned earlier, in certain applications the use of chassis handles is desirable so as to assist in the removal and handling of equipment. Handles are available (from Imhofs) in several sizes, in bright or "satin chromium" finish. The handles removed from TU-units are quite smart when used in the correct manner.

Jack sockets can be obtained with both a black plastic or chromium-plated fixing nut. Once again, if we have more than one socket, they should all be of the same type, and the choice will be decided by which type will give the smartest appearance. (It should be pointed out, however, that in certain applications both connections to the socket may need to be insulated from the panel, and the insulated type of jack socket with black plastic fixing nut is then essential.)

Finally, it is recommended that chromium-plated screws be used on the front panel. It is unfortunate, however, that chromium-plated screws are not very easy to come by!

CORRECTION — "CASCODE CONVERTER FOR TWO METRES"

In this article in our July issue, the 4·7 $\mu\mu$F condenser C9 should appear, in the circuit diagram on p.267, between pin 6 of V3A and pin 1 of V2; and the value for R10 should have been given as 47,000 ohms and for R11 as 3,000 ohms. We much regret any difficulty that may have been caused by these errors.

Push-Pull Modulator for Top Band

WITH SECONDARY APPLICATIONS

W. E. H. HARRIS (G3DPH)

Like all amateurs who are fairly active and whose gear gets plenty of use, the writer came to the conclusion that the Top Band transmitter and modulator were getting a bit sick in their old age and the time had arrived for a rebuild to a new design. But it was obvious there was not going to be room on the chassis to be used for a power pack with the transmitter and a modulator with its power as well. It was therefore decided to build the modulator afterwards and fit it to the RF chassis. The valve line-up for the RF side is a 6AQ5 Colpitts VFO, an EF80 untuned buffer and in the PA a 5B/255M using 250 volts HT. This gives a very good clean 10-watt signal.

Modulator Circuit

This is quite versatile, and makes a good all round general purpose amplifier as well, but here the circuit is dealt with as applied to modulation for Top Band. First, it was decided that enough modulation should be available with just a nice amount of audio in hand, in excess of normal requirements. The unit had to be built fairly compact, with its own power supply, and fitted to the rear of the RF chassis. It was realised that among the miniatures it was going to be difficult to get a single valve to give enough audio output, and hence the circuit Fig. 1 was designed for push-pull output.

Run in Class-AB1 with 250 volts on plates and screens, the estimated output for a pair of 6AQ5's was given as 10 watts with around 3% distortion. This suited the requirement admirably. To digress a moment, many amateurs appear to have insufficient audio power available on Top Band, even with the gain flat out and, of course, in this condition all the distortion available in the amplifier is introduced into their modulation—or, on the other hand, they starve the transmitter as a whole of current by using one power pack only for both RF side and modulator, with insufficient milliamps available, resulting in poor quality and low modulation. A suitable valve to drive the 6AQ5's is a 6C4 connected as a phase splitter—*see* Fig. 1. The gain of this is around two only, but adequate for the job.

For the speech-amplifier the 12AX7 circuitry as shown is well known, and has often been published.

Application

The ten watts output required can be explained in this way: The first need is for a

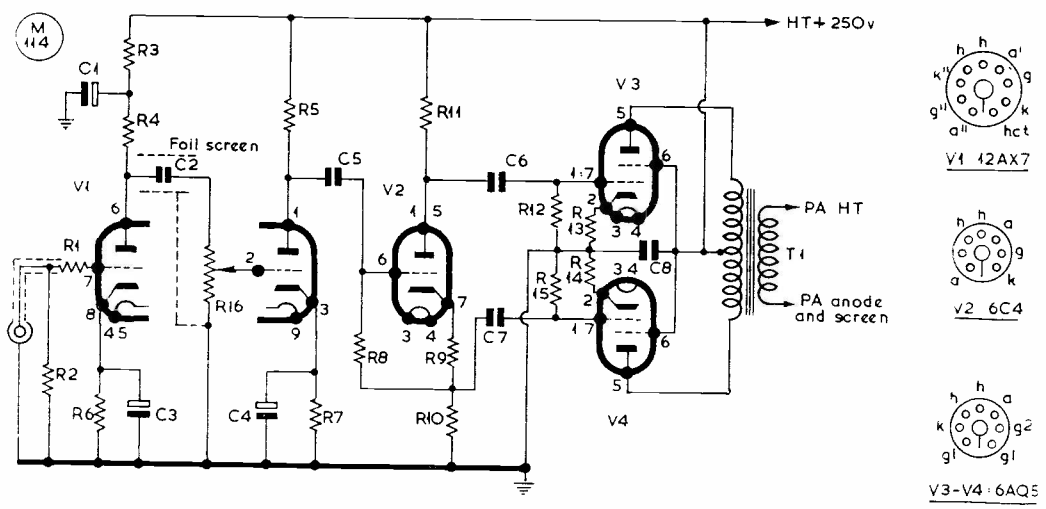


Fig. 1. This speech amplifier-modulator will give ample audio output for Top Band operation, and was designed by G3DPH with the idea of having audio power in hand when modulating the 160-metre transmitter fully. A Woden UM1 transformer is used for modulator-PA matching, but adequate results have been obtained using an ex-SCR522 modulation transformer.

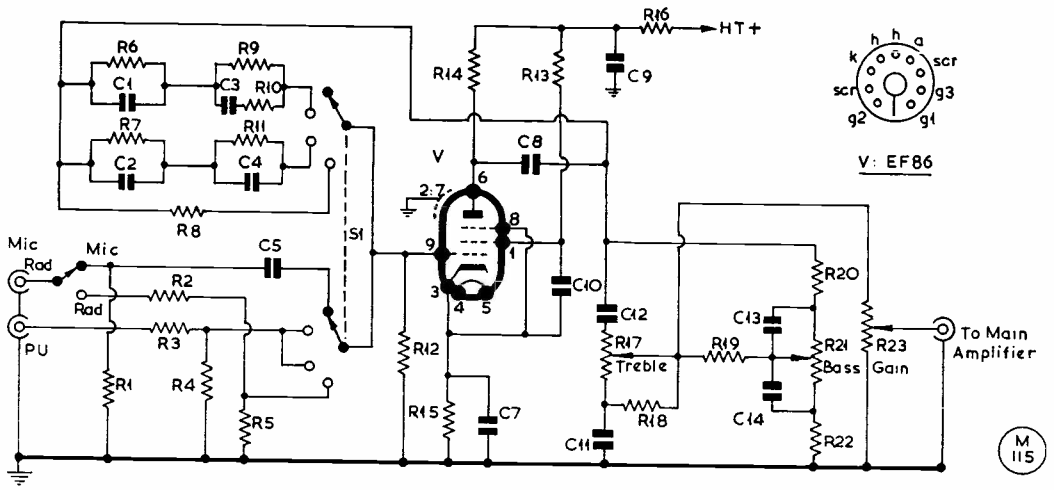


Fig. 2. For good all-round audio results with the amplifier shown in Fig. 1, G3DPH uses a "quality" pre-amplifier with the essential variable controls. This ensures ample gain with the modulator itself working at a comfortable level.

good 5 watts to be available to modulate the ten-watt carrier under plate-and-screen conditions, without having to work flat out, with all the consequent distortion and valve noise. Then all the normal losses involved in getting the audio on to the carrier have to be allowed for, because even in the best and in the most perfectly matched system, losses are still occurring. One of the methods of minimising losses is, of course, to match the modulator correctly to the PA.

In the circuit as finally completed, the gain control is advanced under test conditions to give the usual indication of near-100% modulation; the modulator is then giving ample undistorted output without stress, and quality with a crystal microphone is very good indeed. The anode-to-anode load of the 6AQ5's is 10,000 ohms.

Construction

In the finished design the modulator chassis is 15½ inches long, 2 ins. deep and 3 ins. wide. It had been a low pass filter box; stripped of its components, which left only two or three small holes in it, it was ideal for this job.

The layout of the audio components should keep to the circuit sequence. The coupling capacitor C2 should be wound round with a piece of copper or tin foil and a wire from this screen taken to the earth point on the gain control. This will stop any inclination of the condenser to pick up hum or amplifier noise. A word on the heater wiring here also: If a single line is used, screen this, but if a centre-tap twisted pair is used, it is not so necessary, but is best just to be on the safe side.

As regards power supply, the anode current for the two 6AQ5's is about 35 mA each, with 2·5 mA per screen, and for the modulator a separate power unit was built on the same chassis, using an EZ81, with the 6·3 volt heater fed from a separate heater transformer.

For best results, it is necessary to match the

Table of Values

Fig. 1. Circuit of the Push-Pull Modulator

C1	= 4 μF	R5	= 220,000 ohms, ½w.
C2, C5	= .006 μF	R6, R7	= 6,800 ohms, ½w.
C3, C4	= 2 μF	R9	= 4,700 ohms, ½w.
C6, C7, C8	= .01 μF	R10, R11	= 47,000 ohms, ½w.
R1	= 100,000 ohms, ¼w.	R13, R14	= 200 ohms, 3w.
R2	= 1.2 megohm	R16	= 1 megohm potentiometer
R3	= 47,000 ohms, 2w.	V1	= 12AX7
R4, R8, R12, R15	= 500,000 ohms, ½w.	V2	= 6C4
		V3, V4	= 6AQ5

Table of Values

Fig. 2. Pre-amplifier for the 10-watt Modulator

C1	= 470 μμF, silver mica	R1, R12	= 2.2 megohms
C2	= 270 μμF, silver mica	R2	= 100,000 ohms
C3, C4	= 68 μμF, silver mica	R3, R4	= 82,000 ohms
C5	= 330 μμF, silver mica	R5, R19	= 39,000 ohms
C6	= 0.1 μF, 350v. paper	R6	= 10 megohms
C7	= 50 μF, 12v. elect.	R7	= 12 megohms
C8	= 0.1 μF, paper	R8	= 820,000 ohms
C9	= 8 μF, 350v. elect.	R9, R11	= 1.2 megohm
C10	= 560 μμF, silver mica	R10	= 680,000 ohms
C11	= .0082 μF, silver mica	R13	= 1.5 megohm
C12	= .02 μF, 150v.	R14	= 270,000 ohms
C13, C14	= .0022 μF, silver mica	R15	= 3,900 ohms
		R16	= 120,000 ohms
		R17, R21, R23	= 250,000 ohms, log.
		R18	= 47,000 ohms
		R20	= 68,000 ohms
		R22	= 6,800 ohms
		V1	= EF86

modulator properly to the PA; for this, a Woden UM1 is used, with the taps selected to suit from the impedance matching chart supplied with the UM1. As a matter of interest, the modulation transformer from the SCR-522 was tried, and the results were, even with a small mis-match, very encouraging. But with a correctly matched circuit using the UM1, the modulation is all that could be desired.

As a Straight Amplifier

To put the circuit to this use, a tone-controlled pre-amplifier is needed. Those interested in this application can add this amplifier (*see* Fig. 2) and the results from the two units working together are as good as any medium priced "Hi-Fi" amplifier outfit available today. So for the audio enthusiast this is offered as a straightforward circuit with no frills or fancies; the combination will work well and give excellent results on FM/VHF broadcasting and long-play recordings. Used as a tape playback amplifier it also gives excellent results. Finally, a good loudspeaker and output transformer are also needed to do the amplifier full justice.

THE RADIO AMATEURS' EXAMINATION

The time has come round again to think about the R.A.E. Before that to be held next May by the City & Guilds, the Post Office is, as usual, arranging one for the autumn. This will take place on October 1st, at centres in London, Cardiff and Edinburgh, and those wishing to sit then should apply right away, with a remittance for 25s., to: Radio Services Dept., Wireless Section, Union House, St. Martin's-le-Grand, London, E.C.1. The closing date for this G.P.O. examination is September 3.

A Morse Test session is also being arranged by the G.P.O., to take place in September (if there are sufficient candidates) at Birmingham, Cambridge, Derby, Leeds and Manchester, and will involve attendance at the main post office at candidates' nearest centre. The fee for the Test is 10s., and application should be made immediately to the address given above, as the closing date for this is August 20.

In connection with the City & Guilds R.A.E. in May 1961 (Subject No. 55), courses of instruction have been notified at the centres listed below. This is probably not a complete list, and we would be glad if organisers of R.A.E. courses, or those who may hear of them being arranged locally, would let us know as soon as possible, so that a further list can be published in the next issue of SHORT WAVE MAGAZINE.

Birmingham: Garrett's Green Technical College, Garrett's Green Lane, Birmingham, 33, in the Dept. of Electrical Engineering. Classes begin on September 26, for which applications will be accepted during the week commencing September 12.

Glasgow: At Allan Glen's School, Montrose Street, on Tuesdays (R.A.E. theory) and Thursdays (Morse code), 7.00-9.30 p.m., with enrolment during the week commencing September 12, at 7.00-9.00 p.m. Monday-Friday. These courses are particularly suitable for beginners, as they assume no previous knowledge of radio.

Jersey: Application should be made to the Organiser, Evening Classes, Directory of Education, Library Place, St. Helier. The course is to start in September.

London, **Battersea:** At the Men's Institute, Latchmere Road, Lavender Hill, S.W.11, on Wednesdays, 7.30-9.30 p.m., starting September 28. The fee for the session will be 20s., with a reduction for juniors. Apply at the Institute.

London, **Brentford:** At the Brentford Evening Institute, Clifden Road, on Wednesdays, 7.00-9.00 p.m., beginning on September 20, 10s. per term, or 30s. for the full session. Morse instruction is also available, on Tuesday evenings. Apply for enrolment at the Institute.

London, **Carshalton:** At the Carshalton Technical College. Apply in the first instance to: R. Jones, 2 Morden Park Cottages, London Road, Morden, Surrey.

London, **Holloway:** At Montem School, Hornsey Road, Holloway, N.7, on Mondays, 7.00-9.00 p.m., R.A.E. Theory, 9.00-10.0 p.m. Morse, *repeated* on Tuesdays and Wednesdays same times, starting September 26. Enrolment, at the school, any evening September 19-23, 7.30-9.00 p.m., fees 20s. per course, or 22s. 6d. the two. Apply in the first instance to: A. W. H. Wennell, G2CJN, Hon. Secretary, Grafton Radio Society, 145, Uxendon Hill, Wembley Park, Middlesex. This course has been held for many years, and has been very successful.

London, **Ilford:** At the Ilford Literary Institute, High School, Cranbrook Road, Ilford, on Wednesdays, 7.15-9.15 p.m., 8-month course at an inclusive fee of 30s. These particular classes have been running for the past 12 years, and 218 students have been successful. A course in Morse is held on Mondays, 7.30-9.30 p.m., fee 20s., or 35s. for both. Apply in the first instance, enclosing s.a.e., to C. H. L. Edwards, A.M.I.E.E., A.M.Brit.I.R.E. (G8TL), 28 Morgan Crescent, Theydon Bois, Epping, Essex.

London, **Northwood:** At Northwood Evening Institute, Potter Street, in R.A.E. Theory and Morse, starting September 19; enrolment at the Institute 6.30-8.30 p.m., September 12-14. Enquiries to: G. P. Anderson, G2QY, 16 Warrender Way, Ruislip, Middlesex.

London, **Wanstead:** At Wanstead Youth Centre, in R.A.E. Theory and Morse. Apply in the first instance to: K. Smith, G3JIX, 82 Granville Road, Walthamstow, London, E.17.

London, **Wembley:** At Wembley Evening Institute, Copland School, High Road, Mondays, at 7.0-8.0 p.m., for Morse, and 8.0-10.0 p.m. for Theory, commencing September 19. Enrolment at the Institute, September 12-15, 7.15-9.15 p.m.. This is another old-

established and very successful course, under A. J. Bayliss, B.Sc., G8PD.

Manchester: At the Openshaw Technical College, Whitworth Street, Openshaw, in R.A.E. Theory and Morse, during the 1960-61 evening session. The College operates a modern station under call-sign G3NLT, and instructional staff includes G2CMR and G3HZM.

Norwich: P. J. A. Gowen, G3IOR, will be able to arrange a comprehensive R.A.E. course under the Further Education Dept. of the Norfolk County Council, provided that not less than twelve candidates can be enrolled. Full facilities will be available for this minimum number at nominal fees of 37s. 6d. for three terms, reduced to 12s. 6d. for juniors and *nil* for those under 16. Apply immediately, with s.a.e., to G3IOR at 71 Links Avenue, Hellesdon, Norwich, NOR.60.M, or phone *Norwich 46578* for details.

Reading: At the Collier Evening Institute, Swansea Road, Wednesdays, 7.0-9.0 p.m., starting in the week of September 26. Enrolment at the Technical College, Kings Road, September 16-19, 6.0-8.0 p.m., fees being 35s., reducing to 20s. for those under 21, and 10s. for under-18's. This course is conditional on sufficient local support being received, and has been arranged by the Reading Amateur Radio Club with the Technical College. R. G. Nash, G3EJA, 9 Holybrook Road, Reading, will be glad to give any further information to those interested.

MAKING THE MOST OF METERS—1

BASIC TYPES AND DETERMINING SHUNT VALUES

By J. R. Bradshaw

This is the first of a short series of articles intended to cover the practical uses of various types of meter, with particular reference to the construction of multi-range instruments for amateur applications.—Editor.

THE ultimate value of a meter depends less on its inherent qualities (although these are naturally important) than upon the ability and technical know-how of its user in employing it skilfully to turn mere readings into practical information.

In this way an experienced user derives more information from a simple meter than a tyro can obtain from a rackful of complex test equipment, for the use and value of *any* test equipment is limited only by the knowledge and experience of the operator.

This is the first of a series of articles about meters; about their construction, abilities and limitations; the techniques of improving their versatility and extending their ranges, and their unconventional application to circuit measurements.

The Basic Instrument

Both the voltmeter and multi-range meter are derived from the basic current measuring device, the milliameter (certain exceptions exist which are beyond the scope of this article) and so it is first necessary to consider the characteristics of the movements of the two most popular instruments — the moving coil and moving iron meters — remembering that these characteristics will be retained if the meter is adapted to measure voltage or resistance.

Moving Iron Meters

There are two basic types: (*a*) The attraction type, where current passing through a coil deflects a soft-iron "leaf" to which the meter needle is attached, and (*b*) The repulsion type, which employs the repulsion between two soft-iron "vanes" when both are mounted inside the magnetic field of the current-carrying coil. Current through the coil induces identical polarities in both vanes, causing the moving vane to be repelled from the fixed vane in proportion to the magnetic field produced by the current.

Attraction in (*a*) or repulsion in (*b*) takes place regardless of the direction of current flow; only the polarities are reversed, and this is the most useful characteristic of these meters, which are able to measure either direct or alternating currents. They have the additional advantages of being both cheap and robust.

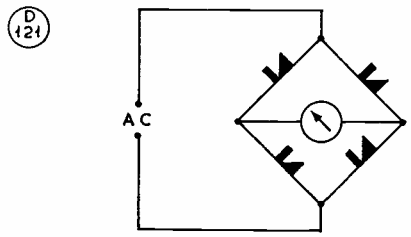


Fig. 1. Circuit of the rectifier arrangement when using a DC meter for AC measurements.

Their disadvantages confine their use to the measurement of mains voltage or filament current, and similar purposes, for the FSD current (*i.e.* the current necessary to obtain full-scale deflection of the meter needle) is undesirably high, so making the meter insensitive. Also, the scale is of low accuracy and non-linear, being cramped at the bottom end (modern meters confine this non-linearity to the initial 10 per cent of the scale) and they are also subject to interference from external fields such as those from a choke, mains wiring or a transformer. [over

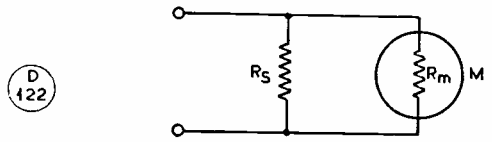


Fig. 2. Milliammeter M with shunt Rs to expand the range.

However, when moving-iron meters are designed to utilise the expanded upper part of the scale, they can be even more accurate than linear-scale readings, because the scale-length per milliamp for a given FSD is probably greater, and these meters find their greatest application in the measurement of currents which are normally in the upper part of the scale, usually as monitor meters in a single circuit. They are seldom used as multi-range instruments.

Moving Coil Meters

In these instruments, the current-carrying coil to which the meter needle is attached is delicately suspended inside the tubular-shaped gap of a magnet, the gap core being of soft iron serving to concentrate the magnetic flux and provide a uniform magnetic field in the gap. Passing current through the coil makes it turn in a motor-like action between the permanent field of the magnet and the field set up by the coil current, so moving the pointer across the scale to indicate the current necessary to turn the coil to that position.

This meter is undoubtedly the most popular and versatile instrument for all normal purposes. Its sensitivity can be as high as 25 *microamps* FSD, and the voltage loss when inserted in a circuit is as low as 50 millivolts. The scale is completely linear, with a highly accurate calibration, although it is neither as cheap nor as robust as a moving iron meter, the moving coil being liable to damage by rough treatment or shock, and easily destroyed by an overload current. Also it measures only DC, requiring an adaptor for AC; this is a bridge-type rectifier, the circuit of which is shown in Fig. 1, which is either switched into circuit (as in a multi-range AC/DC meter) or else fitted as an integral part of the instrument. In either case it becomes known as a rectifier instrument.

Rectifier Instruments

The rectifier converts an applied alternating current into a direct current which can be measured by the moving coil meter, a seemingly complicated process having the advantage of increased sensitivity over the moving-iron instrument, with the ability to measure far smaller currents and at higher frequencies.

Certain disadvantages are inherent in rectifier instruments, largely due to the characteristics of the rectifier affecting meter accuracy. A major disadvantage is that the rectifier impedance is large when applied current is small, the meter calibration being "cramped" as a result (similar to a moving-iron meter) whilst above a certain minimal value, the rectified current is linearly proportional. Multi-range instruments usually overcome this difficulty by a special range for low alternating currents and this is the only solution to the problem.

Additionally, range-changing is more difficult because the total resistance that the combination of meter plus rectifier "sees" must be constant for all current ranges if the convenience of a single, calibrated range (for all except the lowest AC range) is desired.

There is also an unavoidable voltage drop of between 0·5 and 1·0 volt across the rectifier and, due to inherent capacitance, the rectifier response falls as the frequency of the measured current rises; this change in characteristic must be allowed for if the meter is used to measure audio frequencies, and a frequency/deflection chart is usually compiled to correct the observed readings if accuracy is required.

Multi-Range Milliameters

Single range milliameters, purchased for a specific purpose, are uneconomical unless definitely required for monitoring purposes, where a constant watch needs to be kept on the current in any particular circuit.

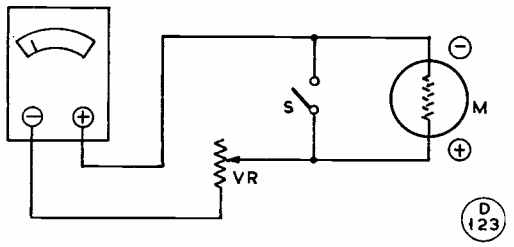


Fig. 3. Finding the resistance of a meter. Polarities circled are when using a multi-range meter where battery negative is on the positive terminals.

There are very few circuits which need constant monitoring, even in a transmitter, and whilst an array of mounted meters, all flicking merrily away in their own circuits, look very imposing, the actual need for them is very small, contributing little or nothing to operational efficiency! Costing money that might well be spent on other items, they can be adequately replaced by a multi-range meter which can either be plugged into a suspect circuit or, by using a multi-range meter connected to a metering switch, can "pick-up" any circuit by the turn of a switch.

In practice, two or three portable multi-range meters, combined with adequate metering points in all equipment, are far more valuable than any number of fixed-range, mounted meters with limited use and versatility. It is also extremely useful to be able to plug in a portable test meter, set on its basic range (and which is normally available for other purposes), completely to check the circuitry of some complex equipment with the help of a metering switch fitted in the equipment for the purpose.

Expanding the Range

It is seldom possible to make a meter more sensitive than its original deflection (although certain war-surplus meters *did* employ internal shunts to *reduce* their sensitivity) if only for the economically obvious reason that the price of a meter increases with its sensitivity.

Therefore, any meter purchased should be as sensitive as possible, the range being expanded as necessary by the use of shunts to provide x10, x100 or x1000 of the original meter scale, so that only a simple multiplication is necessary when using the higher ranges.

There are two methods of expanding the basic

range of a milliameter, both of which will be explained in detail.

The first method involves shunting the meter movement, so by-passing the major portion of the current and allowing the meter to carry only a token current of that passing through the circuit. For instance, if a 1-mA basic movement must be expanded to read 10 mA FSD, then the shunt carries 9-mA, and the meter carries 1-mA. Therefore the value of shunt resistance Rs in Fig. 2 must be 1/9th of the meter resistance Rm so that it carries 9/10ths of the total current, whilst the meter carries 1/10th. The formula for calculation of a meter shunt is therefore:

$$\text{Shunt Resistance (value)} = \frac{\text{Meter resistance}}{\text{Multiplying factor} - 1}$$

This system is most applicable to the single expansion of a meter range, where the object is simply changing the meter range from one to another, but has certain practical disadvantages so far as the amateur is concerned. The first is the accurate determination of the meter resistance Rm, for unless this is specified on the scale (usually in a bottom corner) it must be measured, and great care must be taken to avoid damaging the meter.

An ohmmeter must never be directly connected to a sensitive meter to measure its internal resistance, because the actual applied voltage necessary for the measurement may result in a current through the meter far above that of the meter FSD, resulting in damage or even destruction of the meter movement—a quick but sad end to the whole effort.

Instead, the circuit in Fig. 3 should be set up for the purpose. This requires a multi-range meter set on the " ohms " range, in series with a 25,000-ohm variable resistor, the slider of which is set at maximum resistance and connected to a switch shunted across the meter " M," whose resistance is to be found. Polarities must be watched, because many multi-range meters apply the negative pole of the internal battery to the positive terminal for resistance measurement.

With the circuit connected and the switch open, the current through the meter will probably be small, but VR must be slowly *reduced* in value until M shows full-scale deflection, when the total resistance, indicated on the ohms range of the multi-range meter, can be noted with maximum accuracy. Then switch S is closed, by-passing the meter M, and the resistance (of VR only) noted. This latter reading must be deducted from the first one to give the meter resistance.

Making the Shunt

Knowing the meter resistance, it is now possible to construct the shunt. For this purpose resistance wire should be used, the ohms/ft. value being known and the length of wire for the shunt actually calculable by physical measurement of the wire in inches.

A better system for the amateur, however, uses the arrangement in Fig. 4, in which an accurate multi-range meter is connected as shown with the wire shunt Rs being stretched out on a board or bench and

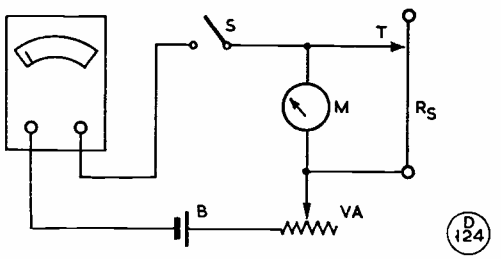


Fig. 4. Experimental circuit for determining shunt resistor value Rs; VA must be variable.

held straight by drawing pins. A tapping point T should be terminated on a pin or needle, so that the tapping contact may be made on the resistance wire without needing to strip off its insulation; VA should initially be set at maximum resistance, the tapping T made at a suitable point (but preferably of lower value than that actually required for the shunt) then switch S is closed.

The multi-range meter indicates the current flowing in the circuit and, so long as meter M is not overloaded, VA must be reduced until the multi-range meter indicates the required (expanded range) FSD current of M. If the shunt tapping is correct, meter M will be at full-scale deflection. If it is not then S should be opened, the tapping T moved outwards (to increase Rs if M is reading low) or inwards (to decrease Rs if M is reading high) and then S closed again to check the deflection of M. This procedure should be repeated until M is at accurate full-scale deflection at the required current (measured by the multi-range meter and adjusted by VA). It is important that switch S is opened whilst the shunt is being adjusted, to avoid overloading the meter.

The length of Rs is then the length of shunt required, but quarter-inch tails should be left on the shunt for mounting purposes. After fitting the shunt into place, the circuit of Fig. 4 should again be used to check the FSD of the shunted meter.

It should be remembered that when a shunt is to carry a heavy current, large terminals must be used to conduct heat away from the shunt, which must be well ventilated and connections to the meter should either be of heavy gauge wire, or copper foil, to minimise heating and unintended resistance.

(To be continued)

LEARNING MORSE — G3HSC

Though originality for what amounts to the G3HSC method of learning Morse has recently been claimed for W6TTB, we are asked by S. N. Bennett, G3HSC, 45 Green Lane, Purley, Surrey, to point out that in fact he developed the system independently some five years ago. Furthermore, the course marketed by W6TTB under the label of Epsilon Records costs $10.0 (about £3 10s.) whereas the G3HSC course sells for 45s. only; he tells us that to date he has sold approximately 1,000 copies of his course.

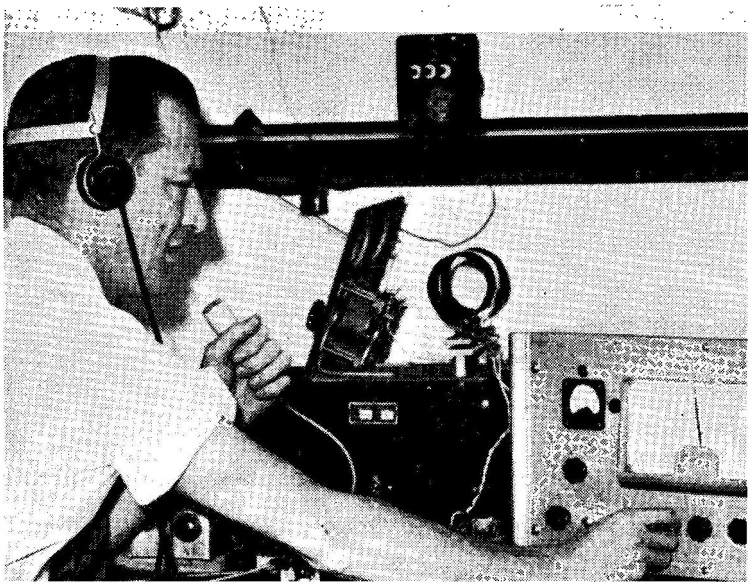
DX COMMENTARY

L. H. THOMAS, M.B.E. (G6QB)

CONDITIONS have been just about as unreliable, and as unpredictable, as the weather. One could waste hours on bands that really were not worth the time spent on them, and then find that one had gone to bed, or switched off, half an hour too soon. Those with the most spare time were certainly those who worked the most DX during these past four weeks or so.

Some good ones have shown up on occasion, and more are on the way (see *DX Gossip).* The pile-ups show some slight sign of becoming more orderly, but there are always those completely hopeless characters who spoil the chances of others without having the slightest hope of working the DX themselves. The noise they make varies in direct proportion to their cluelessness, which must approach infinity on some occasions. They mostly manage to produce notes no better than T7 or T6, are always on the wrong frequency at the wrong time, and it's no good making brief rude remarks at them because they simply can't copy them!

On the more pleasant side, we have a constant up-coming of new DX'ers, many of them G3N's and G3O's, who, although they may show, not unnaturally, a bit of a "novice accent" at times, are far from clueless. Look at the number of new calls in our various tables. Many of these chaps are taking their "baptism of klottery" very well, and with much more patience than your slightly disillusioned scribe. So from that we can say that the future of Amateur Radio in the U.K. is in good hands.



G3MTX

CALLS HEARD, WORKED and QSL'd

DX Gossip

The following "shorts" from all over the world are quoted as a guide to what is going on. Often the dates of prospective expeditions are changed at the last moment, but we can only publish what reaches us in time for going to press.

Occasionally there will be references to a DX-pedition that is all over and done with before readers get the message. We publish such information because there are often queries in the mail about unusual calls heard or worked on the bands, and even retrospective information can be helpful in such cases.

Quite a few interesting sorties are planned, among them the following: 9N1GW hopes to be in AC3, AC5 and East Pakistan in September, using his KWM-1 on 14 and 21 mc, SSB and CW . . . Danny Weil, who was due to be married on July 22, hopes to leave KZ5 in the *Yasme III* about mid-August, bound for Galapagos, Clipperton (possibly), then across the Pacific to the Marquesas; he will not be going to Malpelo (HKØ) as that one is more or less "booked" by the HK's who still hope to make a landing.

VQ9TED is due to start operations from the Seychelles in mid-August, for some six months. He hopes to make trips to Aldabra, Chagos and the Agalegas during that period; bands will be 28, 21 and 14 mc, SSB.

PX1RC, operated by ON4RC and F9XM, is due to be on the air from August 11 to 15, SSB and CW only, 10 watts input . . . XE1CV says there will be another expedition to Socorro (XE4) shortly—SSB only.

The Great Indian Ocean DX-pedition organised by W4BPD, WØAIW, WØMAF and WØUQV is now scheduled to depart in October; all sorts of rare pieces (mostly small islands) will be taken in their stride; full details later, we hope.

AP2CR intends shortly to put East Pakistan on the air with SSB . . . VU2NR hopes to visit VU4 (Laccadives), but probably not until December or January . . . W2EQS, as previously announced, will be signing FP8AS during the first three weeks of August.

New Prefixes: Stations in North-West Australia should be using VK8 by now, instead of their former VK5 . . . Mexico has announced XE5 for Alacran Reef and Isla de Mujeres, and XE6 for Cozumel Island.

Reverting now to the past tense, we note the following: PX1PF was on all bands from July 10 to 23 (ops. DL9PF and DL7AH) . . . KG6ICD, the Marcus Island expedition, made more than 2,000 QSO's, but very few indeed with Europe . . . ZS6IF was due to be operating from ZS7 during mid-July . . . During June-July, Rundy of OD5CT was signing ST2AR and also VS9ARF . . . VQ3HV, 3HE and 5TW were due to operate from Zanzibar on July 15-16 or thereabouts.

9G1CX called off his proposed trip around Africa . . . VE7ALE was to have shown up in GD, EA6, PX and HE during a quick European tour . . . OQ5 became 9Q5 with the change in status of the Congo, and OQØ (Ruanda-Urundi) became 9U5 at the same time. About Somalia we don't know much, but 6O2NG has been heard and *could* be the former VQ6NG! Likewise 6O1TUF must be the former I5TUF.

DX Shorts

AC5PN said to be on SSB . . . MP4TAC has been active again . . . JZØDA is now QRT and no longer on the Island . . . UA1KEA has been on the air from Franz Josef Land (UA1KEC used to be there, but is now "just another UA1").

VS5GS was recently joined there by VS5JS . . . KC6JB is occasionally on 14 mc CW; he was formerly KH6BDV/KJ6 . . . FB8AA is another one on Kerguelen . . . KJ6BV has returned home by now, leaving KJ6 a blank spot.

W7YIS expects a PJ5 call for a quick DX-pedition (may be all over by now) . . . SSB from Liechtenstein—HB1TL/FL used it for a brief spell . . . Some YV's are said to be planning a trip to Aves Island in the future; look out for YVØAA and ØAB.

CR8AC makes infrequent appearances, but stations have been heard calling CR8XG . . . Quite a few HL9's are reported around the bands again; HL9KR, 9KS and 9KU all said to be on 14 mc CW . . . CR5CS is in Portuguese Guinea on 28 mc Phone.

9N1GW, 1MM, 1MD, 1TB and 1FV all reported active from Nepal (that place that never boasted any amateur activity for 30 years or more!) . . . 7G1A has shown up on 14 mc SSB . . . VK9MV is on Christmas Island and promises activity shortly.

LA3SG/P has left Jan Mayen by now . . . FB8CD (Comoros) also due to QRT . . . EA6AR is on SSB . . . TA3GI likewise . . . FF7AK also said to be using that mode.

DX News from Readers

SWL C. N. Rafarel (Poole) reports the following: CR6CA will be on from CR5 (Agada Is.) from the end of July, and later from EAØ (Annoban Is.) . . . I5TUF, Somalia, now signs 6O1TUF (that's six-oh, not six hundred and one!) . . . 9U5 is confirmed for Ruanda-Urundi.

GW3AHN (Cardiff) says that Danny Weil did operate from Baja Nuevo as HKØAA and thinks it will count as a new one . . . ZL4JF (Campbell Is.) very active on 14 mc AM, 0700-0800; GW3AHN has his QSL already . . . MP4BDA (ex-MP4QAO, 4TAE and so on) has been on from

FIVE BAND DX TABLE
(POST WAR)

Station	Points	3.5 mc	7 mc	14 mc	21 mc	28 mc	DXCC
G3FXB	838	77	133	226	231	171	268
G2DC	832	89	121	244	211	167	273
G3FPQ	815	74	118	231	228	164	258
G5BZ	797	66	121	272	206	132	281
G3DO	695	25	51	251	188	180	278
GW3AHN	678	16	55	206	251	150	270
G3BHW	663	15	45	211	223	169	255
GI3IVJ	660	41	70	189	197	163	236
G3ABG	606	56	90	191	141	128	215
G2YS	541	73	93	171	120	84	190
G3LET	521	40	119	189	120	53	208
UR2BU	512	25	57	154	150	126	192
GI3NPP	493	25	48	124	177	119	206
G3IGW	489	51	80	117	123	118	175
G6VC	478	40	60	159	130	89	191
GM2DBX (Phone)	433	34	31	162	105	101	178
UR2BU (Phone)	410	12	33	112	134	119	169
MP4BBW (Phone)	405	1	5	188	131	80	201
G3DQO	404	22	53	183	105	41	192
G3LHJ	373	18	39	109	140	67	175
G3NOF (Phone)	353	8	16	70	138	121	171
G8DI	349	36	67	106	77	63	136
G2BLA	348	37	65	80	87	79	132
G3JUL	346	27	66	85	75	93	142
G8VG	345	37	79	133	57	39	153
GB2SM	338	20	33	80	97	108	186
G3DNR	322	11	30	94	102	85	137
G2DHV	301	22	36	139	71	33	161
G3WP	298	17	34	100	35	112	154
G3MCN (Phone)	297	4	9	63	146	75	182
VO2NA	295	19	39	122	74	41	131
G3BHJ	291	8	29	43	138	73	162
G3GHE (Phone)	269	13	29	37	109	81	150
G2CWL	265	21	29	70	114	31	150
G3LKJ	259	8	19	36	83	113	146
G3JSN	257	32	48	56	64	57	103
W3HQO	246	4	9	84	119	34	200
G3JFF	236	20	55	109	43	9	116
G3NAC	222	16	37	60	74	35	103
G4JA	222	36	46	79	45	16	121
G3NFV	204	12	23	26	56	87	120
G3LAS	197	11	27	55	70	34	106
G3LZF	179	11	20	54	46	48	117
G3JJZ	169	26	41	72	21	9	89
G3IDG	164	15	16	41	47	45	75
G3MGL	98	4	25	38	9	22	57

(Failure to report for three months entails removal from this Table. New claims can be made at any time)

Yemen, 14 and 21 mc, SSB and CW . . . VQ6GM now signing 6O2GM (6O1 is the prefix for the former Italian territory, 6O2 for British). KG6ICD (Marcus Is.) and PX1PF activity confirmed.

G3FPQ (Elstead) says VQ9TED/MM wants to make it clear that he is *not* Ted Henry, W6UOU, and has nothing to do with him. His name is Kewall, and he is a rancher in Kenya.

SWL Peter Day (Sheffield) confirms that ZL4JF is on 14140 kc CW and AM, with a slightly rough carrier; ZL2GX often acts as M.C. . . . W8UTQ/3V8 is active on 14 mc SSB, 1700 . . . VK8NE has been heard on 21 mc AM.

G2DC (Ringwood) spent many weary hours chasing KG6ICD, but only heard him once. An OK with a rasping T7 note was continually calling him and wiping him out,

The lady is W6NZP who, with her husband, runs a radio business in Long Beach, California. They have been touring Europe and this photograph was taken on a recent visit to G5CP, Chesterfield, Derbys.

and admitted that he had not heard him, and asked what frequency he was on! The *Yasme III* Baja Nuevo operation was from 2100 on June 11 until 1700 on June 17; the "island" was a mere sandbank 100 feet by 50 and about two feet high! G2DC confirms that Weil will be signing KZ5WD for a while, and after getting married will visit Guayaquil to pick up the Galapagos licence; he then hopes to operate from HC8 for 10-14 days; after that, Clipperton and the Marquesas.

Another red-hot one from G2DC—JA1EE will undoubtedly rate as a new country; he is on Tori Is., about 400 miles from the Japanese mainland. JA1ADM is due to go there to get the new station launched . . . UA1KEM is on 14330 mc SSB from Franz Josef Land.

Several of our correspondents, among them SWL's Rafarel (Poole) and Bullivant (Edgbaston), comment on the activity among the 9Q5 amateurs during the troubles in the Congo. For a while it seems that they were the only link between Leopoldville, Tyseville, and the outer world, and they were handling rescue and personal messages for hours. Certain VQ2, VQ4, VQ5 and CR6 and I stations were lending a hand, too, and many others were co-operating by keeping the frequencies clear. There is no doubt that amateurs and Amateur Radio played a vital part in the rescue work during this distressing business, and in general provided about the only reliable communications there were until the arrival of the United Nations forces with their signals equipment. And yet, by the book, they were breaking all the rules and are liable to prosecution for handling third-party traffic! (Under the Geneva Convention, the rules about this are the same for all countries; the U.S. amateurs who are heard working phone-patch do so under a special F.C.C. dispensation related to the type of traffic handled and the existence of normal communication facilities for passing personal messages.—*Editor.)*

The Country Conundrum

Anyone completely outside Amateur Radio would probably derive even more amusement than we do at the curious efforts from within the fraternity to lay down the law about "countries." Little rocks and atolls that none of us ever heard of suddenly acquire "country" status, while other places that philatelists insist are "countries" have to share the title with someone else. Gold Coast turns into Ghana, remains in the same place, and even the same operators stay on the air with the same gear; yet if you work your first 9G1 you have acquired an addition to your score, however many ZD4's you had worked before. (Yet when VS7 turned into 4S7 nothing of the kind happened; nor when VS2 became 9M2.)

The whole thing adds up to complete nonsense. But we must remember that the ARRL only pontificates where countries for the *DXCC List* are concerned, and DXCC is their own show—a purely domestic award, sponsored and issued by the ARRL only, so they have every right to make their own rules, just as we do for the Certificates we issue.

The time has come, we think, for two different standards, of which everyone is free to choose one or the other. On the one hand, the ARRL list of "DXCC Countries"; on the other, the list of "Actual Countries." (One

WPX MARATHON

(Starting January 1, 1960)

CW Only		Phone Only	
G8DI	277	G3GHE	249
G6VC	275	MP4BBW (*SSB*)	240
G3JVL	246	G3DO(*SSB*)	204
VU2XG	231	G3LAS	164
G3LAS	223	G3LHJ	150
G4JA	175	G3MCN	101
G8VG	171	GM3NQB	100
G3LZF	164	GM2DBX	92
G3NWF	151	G3BHJ	87
G3JSN	141	G3NFV	82
G3DQO	137	UR2BU	80
G3LHJ	130	G8VG	73
G3WP	110	G3JSN	67
G3JVU	109	G2FQW	66
G3MGL	108	VO2NA	54
G2BLA	103	G3DNR	49
VO2NA	90	G3NWF	47
G3DNR	85	G6VC	40
G3JFF	84	G4JA	38
UR2BU	79	G3MGL	17
G3GMK	71		
G2BP	62		
G3NTU	61		

(Stations not reporting for three consecutive months will be deleted)

could, of course, expand this with "UN Countries," "Philatelists' Countries" and "Atlas Countries" . . . when *is* a country not a country?) Meanwhile, when we talk here about scores we will allude to DXCC counts, not just "countries," until someone thinks up something better and more acceptable to all.

News from Overseas

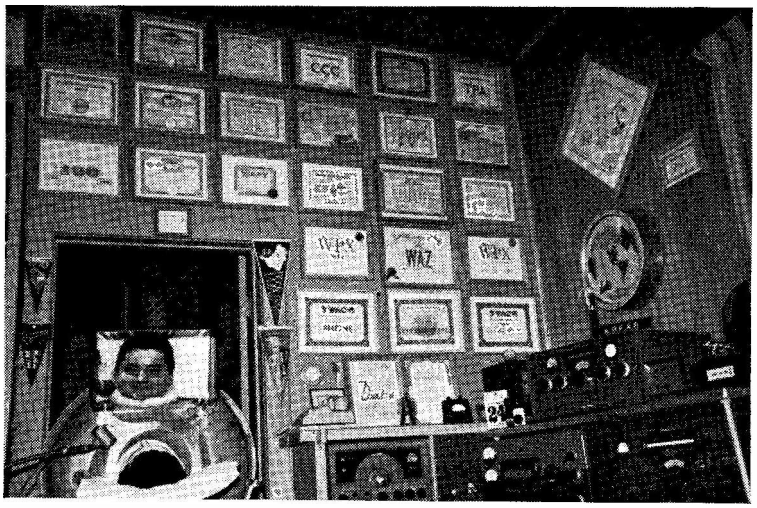
Peter Windle (VU2XG) is suffering from monsoon QRN, but recently, while looking for his father (G8VG) he happened on ZP5LS (14 mc CW) and made his first QSO with ZP. He had never even heard one before! He also raised UO5AN, his last remaining U district; so, although he never found the OM, it was a good session. VU2XG has worked over 110 countries in seven months from VU; previously, in Ceylon, he only managed 120 in three years.

VS6DV is the call of Little Sai Wan Amateur Radio Club, which, unfortunately, is closing down in August, when Brian Mudge, VS6ED, who holds the licence, will be leaving. VS6EE was to have taken it over, but he, too, is departing from Hong Kong in the direction of Labuan, where he will show up as a ZC5. VS6EF is also on his way home, where he will sign G3LZV. The recent tropical storm "Mary" blew down practically everything in Hong Kong, including nearly all the VS6 aerials.

Conditions out there have been bad, but some intriguing calls have shown up, including BV3HPT, C3HHR and C9TSY. VS9ED looks on them as highly suspect, and wishes he knew more about DF technique so that he could take a check on them.

DL2BC will be QRT, after three years, by the time this is in print; and he will be signing GW3OAZ from Pendine after that; he would like to hear from any GW in that area.

DJ3VG (Delmenhorst) is a regular reader, and works almost entirely on 14 mc CW with 100 watts. Recent contacts have been UL7HV, UAØBN, JT1KAC, CM8RM, KR6GY, VP9G, CT3AV and UJ8AC; he has found conditions very poor and agrees with us that lots of patience is necessary.



K9EAB, of Peoria, Ill., is 22 years of age and has lived in an iron-lung for more than half his life. Though in an advanced condition of paralysis, the mirror reflects a cheerful face. A keen award hunter and CW operator — he works the key with his right thumb —K9EAB holds no less than 69 DX certificates (including our WBC) with "over 30 more in various stages of completion." He also has 173 countries confirmed on SSB. The transmitter runs the full kilowatt and receivers are Collins 75A-4 and RME 4350; a tri-band beam and trap dipole complete the outfit.

The DX Bands on CW

There is such a heavy mail this month that we are referring in the text only to unusual doings or comments by readers, and listing their DX worked separately at the end of each section. This is what several readers have suggested, and if it proves popular there is no reason why we should not make this the permanent presentation.

Not much actual excitement this past month, but plenty of bread-and-butter DX with some appetisers for the keen 'chasers. PX1PF kept them busy on all bands, and some welcome JT1 activity was also noted.

G3NAC (Yatesbury) says it was a pleasure to listen to PX1PF's pile-up technique, but oh, those OK's who zero-beat and then call CQ! G2FFO (Burnley) collected both JT1KAB and '1KAC, and also heard JT1AB. Now he's chasing FR7ZD for Zone 39, the last gap; and he was pleased to find that PY7LJ is on Fernando Noronha.

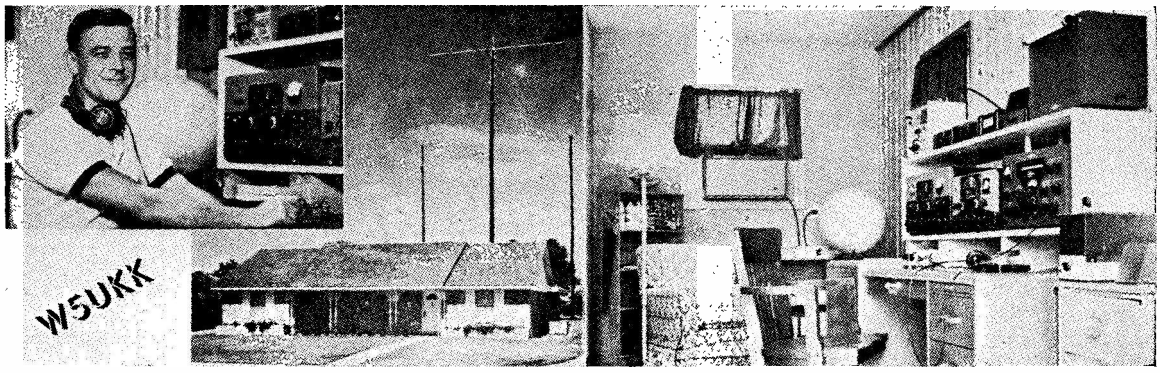
G6VC (Northfleet) had a personal call from W7QNI, who was off to OZ and finally to DL . . . GW3AHN raised MP4MAB/4WI on 14 mc and HKØAA on 21 mc —both very acceptable . . . G4JA (Baschurch) found 21 mc open until 0200 on some occasions, and VK7KA was 589 at midnight on July 9; YN1CRU was worked at 0100 GMT with a 599 report, and a new country, too!

G3JVL (London, W.5) has been presented with a junior op. (a YL) so DX is in the background for a while; but he did raise HC1JU, LA3SG/P, PX1PF, 7G1A and others—all 14 mc. GI3IVJ (Belfast) acquired HKØAA after sweating it out for 2½ hours (14 mc).

G3FMN (Frimley Green) worked RAEM, an old acquaintance, also HB9YG/MM and UM8KAB, all 14 mc . . . G3FPQ says that, contrary to rumour, VS5GS *does* QSL — but not through the bureau and only for an IRC; fair enough.

G3LPS (Blackburn) heard JT1KAB and worked JT1KAC . . . G3DNR (Broadstairs) reports for the last time from his present QTH, and he hopes the one he is moving to will be a good one, DX-wise. New for him were EL4A (14), VQ3HZ and 6O2NG (21).

G3JJZ (London, S.E.6) thinks



The station, home and aerial system of W5UKK, Houston, Texas. His transmitter is a Johnson Kilowatt and the receiver a Collins 75A-4, with a wide-spaced beam.

the lids and klots are on the increase, and his chief complaint is about the YU's, who have blotted out several rare pieces by five-minute CQ's on the frequency. (Now, he doesn't, and we don't, mean that *all* YU's do this sort of thing; only enough of them to make it unpleasant!)

G2DC comments that 14 mc is still spoilt by short-skip, but he beat it and raised HKØAA and FG7XF for two new ones; 21 mc is pretty dead most of the day and suddenly wakes up in the early evening. He has on occasions worked VS9OM by *long path*, around 2100. New ones were 9Q5IG and 6O2AB; HKØAA also worked.

CW DX Worked

14 mc Band

GI3NPP: BV1USC, TI2PZ, W8UTQ/3V8, ZA2AV, OHØNC, VS9APS, 7G1A, RAEM.

G3JJZ: CE4AD, ET2US, FR7ZD, SVØWR, TF2WFF, UH8BI, UL7CD, VS9MB, YN4AB, ZP5AY.

G5BZ: LA2TD/P, VP5VB, ZK1AK, HKØAA, CP3CN, FY7YG, ZL4JF, PJ2AE, FB8CS, XZ2TH, LA6CF/M, HL9KT and JT1KAC.

G3BHW: LA3SG/P, JT1KAC, PX1PF, UM8KAB, VP2KD, VP5VB, VS9OA, 6O2AB.

G3LPS: ZD6BG, FB8XX, JT1KAC, TI2PZ, UAØFR (Sakhalin), 9K2AD, WA6KMT/KL7, PX1PF.

G3FPQ: HKØAA, VS5GS.

G3WP: 7G1A, F9UC/FC, OD5LX, YN4AB, UL7CD, VKØWH, HK3RQ.

G2VV: CE3AG, OD5AR, HC5CN.

G4JA: W8UTQ/3V8, ZP5AY, OD5LX, KZ5TD.

GI3IVJ: CE1DE, CM8RM, ET2US, HC2CS, HKØAA, KA5MC, KG4AD, OA4KF, UPOL9, YN4AB, ZP5AY and 5LS, ZK1AK.

21 mc Band

GI3IVJ: CX6CB, JA1ACB, UAØAG, 6O2AB, 9M2EB.

G6VC: CX2BT, CT3AB, VQ2MS, UG6AW, 9Q5IG.

GI3NPP: KM6BT, DU7SV, VK9XK, HKØAA, KG6AN, CP3CN, M1AG, YA1BW, FB8XX and 8CJ, PY7LJ, OR4TX, 9U5VS.

G3LZF: ZS3R, CR7FG, VQ3PBD.

GW3AHN: HKØAA, 9Q5EH, 9Q5RU.

G2VV: W6EAQ/MM, ZD2IHP, VS5PM, EL4A, OQ5IG, JA1CRT.

G3FPQ: CR5AR, HKØAA, KM6BT, VS9MB.

G3LHJ: JA7AD, KG6AJT, WG6AJI, VS5PM.

G3BHW: HKØAA, HP1SB, LX3HD, VS5PM, VS9MB, XE1UU, 6O2AB, 9Q5IG.

G2DC: CX1's, DU7SV, KZ5WD, HC4's, HP1SB, MP4QAO, OA4FM, PX1PF, JA's, VP3MC, VQ3HZ, VQ6AB, VS9MB, VS1's, XE1PJ and 1AJ, YA1BW, YV5DE.

The DX on AM Phone

G2BLA (Welwyn) will have to come into this section, although he used NBFM! With that on 21 mc he raised ZC4 and 9G1 . . . G3GHE (Reading) found 21 mc "the shift-worker's paradise," as it was open for so many parts at such varying times—*see* his list for results.

GW3AHN raised ZL4JF on 14 mc and HKØAA on 21 mc—both new; he also worked 9Q5FV, 9U5VS and 6O2GM. G3NWT (Sandiacre) even found 28 mc worth looking over at times, and says that when the band is open to ZS it's better than 21 mc. He doesn't think the phone DX'er has to queue up so long as the CW man.

G3NOF (Yeovil) confirms that 28 mc was wide open to Africa for long periods, but has been dead recently. 21 mc has been opening to North America as early as 1130 and remaining that way until 0800 the following morning!

AM Phone DX Worked

14 mc Band

GI3IVJ: HI8JSM, HP1SB, KG4AO, KP4AKB, VP2DU, ZL4JF.

G3FPQ: ZL4JF.

G3JZL: VP3MC, HK3LX, EA6AI, OQ5VA.

21 mc Band

G3BHW: KG4AO, VK9AS, VP2LS, VP3MC, VP4LA, VP5EM, VQ1HX, VR2DE, VS5GS, 6O2GM.

G3LTZ: YA1BW, 9M2DX, 9Q5LJ, MP4BCV, VS5GS, M1B.

G3JZL: FQ8AW, OQØDM.

G3LHJ: CR6CN, EL4A, HK3DS, VS5GS, XE3CW, YV3CZ, VU2PK, 6O2GM, 9M2FX, 2GV.

G3FPQ: FK8AT, KG6AJF, KC6RF, KJ6BV, VP2GAB, VR2DE, VS5GS, XE1JP, 9U5JH.

GI3NPP: KJ6BV, VR2DE, 2DS, KG6AJF, VP2LS, VKØWH, FB8XX, OHØNZ, 6O1TUF, 6O2GM, 9U5PD.

G3GHE: CE1BD, 6EZ, CO's, EL4A, FK8AU, 8AX, HC2OM, 5TI, HH2ML, HI7CJY, 8JSM, HK's, HR2MT, KG6AGL/MM, KG6AJF, MP4's, OA1W, 4H, PJ2AW, PZ1AP, TG9TI, VP3, 4, 5, 6, 7, 9, VR2DE, 2DF, 2DS, VS5GS, XW8AL, YN1LC, ZS3B, 9G1DI, 1DN, 9K2's, 9M2's.

G3FMN: CO6DX, CO7RO, TG9TI.

G3NWT: VR2DE, 2DS, 9N1MM, DU6MG, 9M2's, VU2BK, 6O2GM, VP2SL, VP5EM, ELØJ/MM, OHØNZ.

G3NOF: CE1CX, EL4A, FG7XH, HI8DGC, HP1SB, VP2SL, VP3MC, ZD2's, ZP5CF, 9G1CC, 9Q5FV, 9U5BH, 5VS.

GI3IVJ: CP1CJ, HC1IT, I5TUF, KG4AO, OA1W, PJ3AD, PZ1BK, TG9FI, 9RY, 9TI, VKØWH, VR2DE, VS1's, VS5GS, VS9MB, VP3RW, XW8AL, ZP5GO, 9M2DQ, 9N1MM.

28 mc Band

G3NOF: CN2BN, CR6BY, 6CZ, LU3DGX, PY's, VQ2's, VQ3PBD, ZE2JA, ZS1's, ZS6's.

The DX on SSB

The scarcity of AM Phone DX reported for 14 mc is compen-

sated for by the SSB reports, which make it clear that certain countries are easier to raise on SSB than other modes. It's increasing all the time, and the SSB man seldom goes back to AM—he can't stand the squeaks and whistles!

As there are no particular comments, we let the SSB section speak for itself in the following lists:—

14 mc Band

G3FPQ: ET2US, HV1CN, KG6ICD, LX3EQ, MP4MAB/4W1, PZ1AX, ST2AR, VQ9TED/MM, W3ZA/EP, ZS7P, 9M2DB.

G3BDQ: KR6KU, BV1USC, KG6AIL, VS1's, UP2CG, HZ1AB, VK4RQ, YV5AFJ, W3ZA/EP, ST2AR, VS9AZ, MP4MAB/4W1, 9N1GW, 9K2AM.

G3DO: UP2CG, CX2AX, W3ZA/EP, ST2AR, VS9AZ, LX3ZX, ZC4AK, LU's, MP4MAB/4W1, W8UTQ/3V8, 7G1A, VQ3GX.

G3NOF: CN2WH, 8JF, CT3AV, HC1FG, MP4's, LX3's, PZ1AX, OHØNC, OK1FF, ST2AR, UA9CM, UP2CG, VS9AZ, W3ZA/EP, W4ZLE/VO2, W8UTQ/3V8, 9G1BF, 9K2AM.

21 mc Band

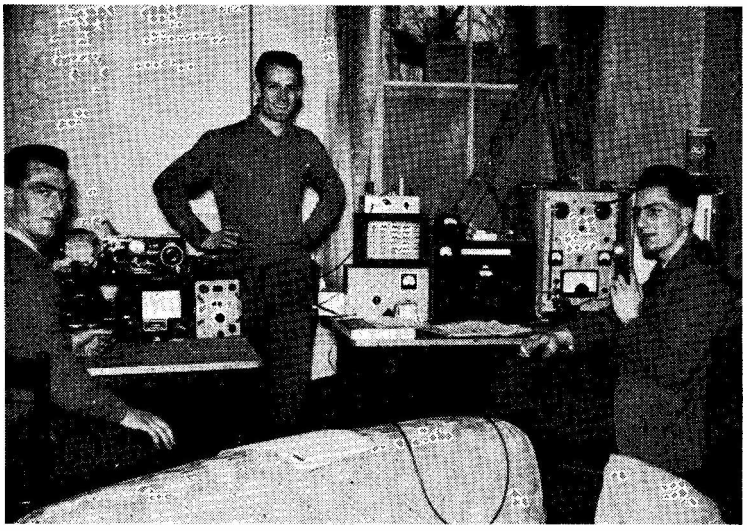
G3DO: FS7RT, PJ2AF, 9Q5AG.
G3NOF: K4UKW/VE8 and W's.

Eighty and Forty

Eighty isn't showing much DX, except for those who don't mind getting up at 0500 in order to work a few East Coast W's—and there are not many of those enthusiasts. G3NAC booked in F2CB/FC on *Eighty* and LX1CF and VE1EH on *Forty*. G3LYY raised LX3JW and UB5HZ on *Eighty*, where he also heard K2FN around midnight, but couldn't raise him.

G3NWF (Petts Wood) works *Forty* only, and he has not found it too brilliant; but stations worth noting on CW have been OX3WW, PY7AEE, TF3AB, YV1EM and KV4CI/MM (near KP4). He heard ZA2BAK, who, so the rumour goes, is a genuine Albanian station; Luxembourg raised his WPX score by three, thanks to LX1CF, 2GH and 3JW; K3GKP was also worked—the only USA station heard on the 40-metre band.

G4JA, on *Forty*, got OX3RA and ZA1KC, whom he hopes is legit. G3FMN (*Forty* CW) worked LX1CF and LA9TG/U. He, too, worked ZA1KC, back in May, and he received his QSL direct. (QTH was "Niko," Box 42, Tirana, Albania.)



This was the outfit signing GB3LAS from Douglas, I.o.M., with, from left to right, G3MDR at the Top Band rig; G3MIK and G3JZK on the HF equipment. During their 10 days' stay, 60 countries were worked under difficult conditions. These chaps had a good time on the trip, and hope to organise another.

G3JJZ worked UA3's on *Eighty*; LX3EN, UQ2CZ and other Europeans on *Forty*, where gotaways were UR2CP and KP4KP. G2DC raised CT2BO and PX1PF on *Forty*, and PX1PF again on *Eighty*.

G2BLA was lucky enough to get PY7LJ (Fernando Noronha) on 40 metres, where he also worked OX3RA, PY2, and CR6CS.

SWL Peter Day has logged CR6CS, ZA1KC, TF3AB, HB1EO/FL and F2CB/FC, all 7 mc CW. On phone, same band, he heard HP1CN, HP3FL, HC4IE and HK4PY, all between midnight and 0200.

Top-Band Topics

W1BB writes to say that things are slow now, *but* W8GDQ is running very successful skeds with ZL3RB, and they make it nearly every Tuesday morning (0945 GMT). W8ANO also joined in and had QSO's on both CW and phone! The ZL is on 1999 kc, the W's on 1820 kc.

G3NTI (Wirral) joins the Ladder with 58/60, using a 200-ft. (loaded) aerial in a quarter-wave garden! Recent QSO's: GC3KAV, GI3MCZ, GM3KLW and 3COV, DL1FF, OK1AAE and 1VG.

G3JBU (Northampton) also joins (52/52) and puts in a plea for some activity from Cornwall; in seven years on Top Band he's never heard that county; he would also like "some of the rarer Scottish stations to drop us a line and say when they are on"—then WABC aspirants would know when to look for them.

G3APA (Coventry), whose report was received just too late for last month, tells us that he operated from Rutland during June and made quite a few contacts. He was on the site of a partly-built radio station and borrowed their 135-ft. mast! He hopes to manage some more /P operation from now on.

G3MCY (Tangmere) has received his QSL from ZB2A, who says he hopes to be fully operational on 160 metres next season; G3MCY will be QRT until November, as he is off on a course.

G3OAG (Prestwich) worked GW5PP/M (Caernarvon), GM3IQO/P (Inverness) and G3IHH (Berks) for new ones: he objects to the use of the LF end of the band for phone; but there

has never been any agreed band-plan for One-Sixty, and there's often plenty of CW at the HF end, too.

G3NVO (Middlesbrough) has worked 61 counties within seven months of getting his licence—good going indeed. Recent additions were G3IXB/P (Cumberland), G3APA/P (Rutland), GM6IS/P (Renfrew), G3JFH/P (Westmorland), GM3IQO/P (Inverness and Sutherland), GM3NNE/A (Fife). G3NVO mentions that he is still at school; and in the same form are G3NVN and G3NVV. Quite a concentration, that, and probably a record of some sort!

G3ABG (Cannock) has returned to Top Band and is chasing WABC on phone, which he finds "great fun," having collected twenty counties in four evenings.

G2HPF (Chelmsford) is contemplating a trip to Scotland during August, and will operate /A at various locations; he invites anyone to drop a line and make suggestions, and he will try to oblige; he hopes to manage three counties *per night* by choosing locations carefully! Probably August 12 onwards, operating 2100-2359 GMT (*QTHR*).

G3NNO (Leeds) worked G3IQO in *five* different Scottish counties during his tour, and several other /A and /P operators have put his score well above the desired 60 mark—cards to follow, he hopes! He, too, has decided to go on a GM expedition for about five days, with operation on four nights; no details yet settled, but he will be able to give them over the air from the home station.

G2YS (Filey) still intends to make his GW trip; and many other August expeditions are planned by regular 160-metre mobile types. Any call with /A, /P or /M after it will be worth investigating.

Miscellany

G8LG (Sunningdale) endorses our remarks on Tannu Tuva, and obviously has all the essential information on the subject. It has not existed as a separate country since 1944, when it was absorbed in the USSR and became the Tuvinian autonomous province (until 1912 it was part of the Chinese Empire and after that a Russian protectorate: and then it even had a spell of independence!). So—it's interesting as being in Zone 23, but not for any other reason.

"G3HIO" is apparently a pirate; the former holder of the call reports that although he gave up the licence five years ago he is again receiving QSL cards, and it appears that someone in the Nottingham area has illegally adopted it.

G3JUL writes from the Science Museum to say that GB2SM welcomes skeds with stations *anywhere*, who are interested in making contact.

GI3NPP tells us that he has now passed the 200 countries worked mark, after only nine months' operation. FB! (Now for the third hundred. . .)

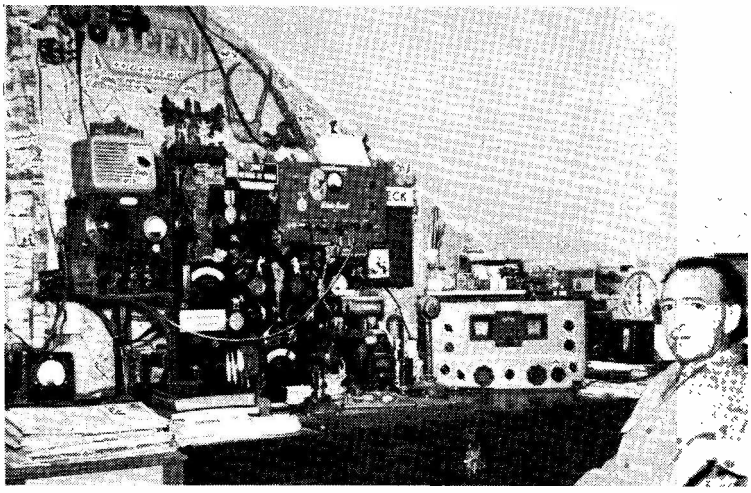
Correction: For "VO1FD" on p.250 last month, read VO1FB; this is important for the FP8BD

TOP BAND COUNTIES LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
G2NJ	98	98
G3JEQ	97	97
G6VC	96	96
G3JHH	94	94
G3KOR	90	94
G3APA	82	87
G3ABG	79	82
G3JJZ	78	80
G3MCY	74	75
G3FS (Phone)	68	72
G2CZU (Phone)	67	68
G3NFV	64	67
G3MXJ	63	70
G3MWD	63	66
G3NBP (Phone)	60	62
G8VG	58	67
G3NTI	58	60
GM2HIK	56	63
GW3NAM	55	69
G3NNO	53	74
G3JBU	52	52
G3NNF	50	52
G3NVO	48	61
G3KOE	45	53
G3JFF	41	53
G3NJQ	36	42
G3LZF	34	53
G3NAA (Phone)	33	46
G3NTU	26	38
G3NNO (Phone)	21	43
G3MXJ (Phone)	16	33
G3ABG (Phone)	8	20

(Failure to report for three months entails removal from this Table. New claims can be made at any time.)



W1EFN of Pittsburgh, Mass. was first licensed in 1924 under callsign 1ARH. Since then he has had nearly 43,000 contacts and, as a keen 160-metre man, has worked 21 countries on Top Band. *Photograph W1BB.*

QSL's. which can also be sent *via* G3LMD.

CQ DX Contest, 1959

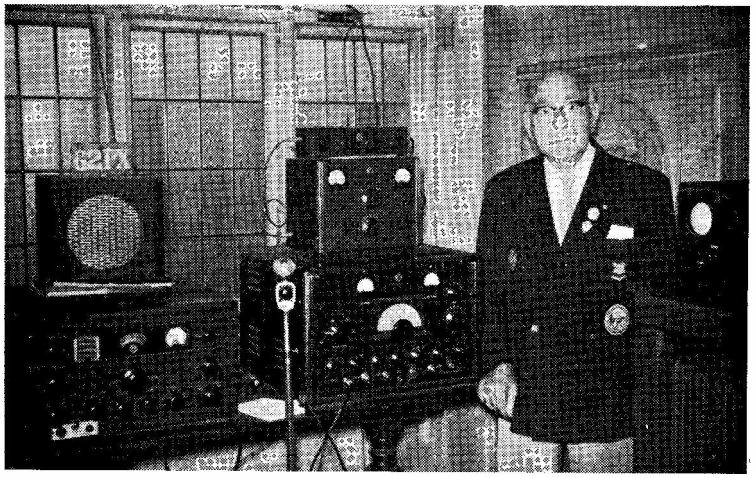
The full results are out, and it is again clear that U.K. operators don't support this Contest, for some reason or other. In the Single-Operator Phone section there were nine G entries, plus one GI, one GM and three GW's. By comparison, there were fifteen OH's, twenty-four DJ/DL's and seventeen PA's !

In the CW section (again Single-Operator) there were sixteen G's compared with 68 OK's and 32 SP's. The G's were also outnumbered by the DJ/DL's and the SM's.

G3FPQ was the U.K. hero in this affair. coming fourth in the world All-Band Single-Operator Phone section with his fine score of 565.080. The winner was 4X4GB (829,864) with VQ4DT and CN8JF second and third. In the multi-operator section **GB2SM** also upheld the British colours by coming fifth with 282,266. First was HZ1AZ with 476,190; second CN8AR. third DJ3VM and fourth DL6NK. **G5MP** also appeared in the phone roll of honour by heading the 3.5 mc entry with 1357 points.

Turning to the CW side, **G3FPQ** again did his stuff and reached fifth place with 507,552. In this, the single-operator category, CN8JX was outright winner with 1,156,322 points; second 7G1A; third 4X4KK ; and fourth UB5WF. The other G in the roll of honour was **G2BQC**, who was fifth in the multi-operator section with 274,670. (It has always puzzled us why the multi-operator scores are usually lower than the single-operator. In this case W1BIH was first with 527,945—less than half the score of CN8JX in the single-operator division.)

Other highish-scoring U.K. stations were as follows : *Phone*, G2DYV, G3JZK (28 mc), GI3JIM, GM3BCL. *CW*, G2DC, G4CP, GI3IVJ, GM3EOJ and GW3JI. (All these were single-operator stations.) In the multi-operator bracket the higher scorers were G3HTA and G3NTJ on phone; G3FUR on CW. All those mentioned had six-figure scores.



G2PX, of 3 Overton Drive, Wanstead, London, E.11, has been on the air since 1913 and has a wonderful record of DX experience, including collaboration with the Marconi Co. before a regular broadcasting service was started. In 1920, 2PX as he then was transmitted regular Sunday-morning musical programmes on 1,000 metres, which were heard in many parts of the country. He then went on to 440 metres and later 170 metres, which was a very-HF band in those days ! G2PX as you see the station here consists of a Panda PR-120V transmitter and AR88D receiver, with a LPF and band-switched ATU. Aerials are a ground-plane for 10-15 metres, and an 8KW trapped dipole for the LF bands. More than 240 countries have been worked on 10 and 15 metres.

Summing up—we had a fine proportion of high scores considering the relatively small entry. Thus, the quality was very good, but the quantity left much to be desired—which we might look on as a brighter state of affairs than the reverse would have been !

The rules for the 1960 Contest are now out, the dates being as follows : *Phone*, October 29, 0200, to October 31, 0200 ; *CW*, November 26, 0200, to November 28, 0200. All the usual categories of entry, the same sort of conditions as always, and the dates for logs December 1 for Phone and January 15 for CW. The only notable change will be that multi-operator stations will all be judged on an all-band basis this year. Full rules next month.

Late Flashes

PX1PF lost their 40- and 80-metre ground-plane in a storm, which interrupted things somewhat; then they put up a new GP for 40 and a long wire for 80 . . . ZC5AE is on 14 mc CW, 1000-1400 GMT . . . 9N1FV on 14 AM, 9N1GW on 14 CW . . . VK9HC left Cocos-Keeling hurriedly when his two-year-old son became ill; he will not return . . . Campbell Island has *no* mail service, so no QSL's from ZL4JF until his return to N.Z., probably in November . . . VR1D will be on Funafuti Atoll, Ellice Is., for about a year.

And that brings us to another close until next month's deadline arrives. It will be first post on **Friday, August 12** — the Friday after you read this, so get down to it now and send all that news along. Please remember our simple new rules—separate out CW, AM and SSB on the HF bands, and if you're sending a *long* list of DX worked, keep the calls on their own and let's have your comments and remarks separately.

Acknowledgments to all sources of information, particularly the *WGDXC Bulletin*, W4KVX's *DX*, the *Western Radio Amateur* and all our own chasers and SWL's. Even if the DX gets thinner, the post-bag does not, so keep it up ! Meanwhile, Good Hunting and 73.

• • • The Mobile Scene • • •

RECENT MEETINGS RECORDED — FORTHCOMING EVENTS

WITH the season for Mobile Rallies reaching its peak, there is a good deal to report this month. And there are still some important meetings to come. The close of the Rally season has, not unnaturally, become established at about mid-September, but that does not mean that all /M activity will then cease. The keen mobileer, who keeps his gear on the car all the time, will be out and about at every opportunity, particularly at week-ends, when there are always fixed stations to work. It is true that later in the year Top Band becomes noisy and crowded after dark, but it will be very good for daylight working.

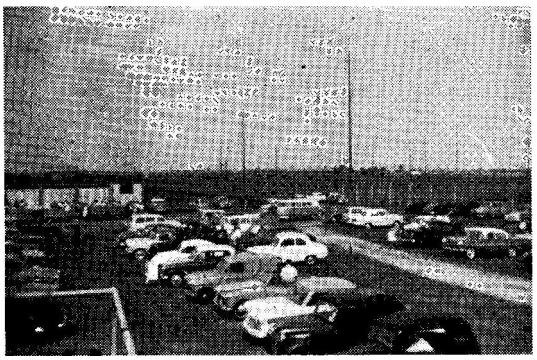
* * * *

On June 19, the Amateur Radio Mobile Society held a most successful meeting at Barford St. John, Oxon., the transmitting site for the U.S.A.F. communications centre at R.A.F. Station, Croughton, some miles away. The weather was perfect and the attendance was estimated at about 500 total, with some 200 callsigns in the visitors' book and more than 100 cars fitted /M. These figures include about 30 holders of U.S. amateur callsigns, and it was probably the first get-together of W's in this country.

The site being an ex-R.A.F. airfield, there was plenty of room, but that also meant that certain facilities had to be provided for the non-radio interest; the XYL's and harmonics soon get tired of standing about in the car park. The attractions for them included a 70-seater jeep-train making continuous free trips round the base; a magnificent display of precision marching by one of the only four such American drill teams in the U.K.; a baseball game; and refreshments stands purveying typical American fare. Local control was through an excellent public-address system, provided by the U.S.A.F., which was used for playing music as well as making announcements.

On the radio side, two buses ran a shuttle service across to the transmitting station itself—with its own diesel-electric generating plant, extensive aerial farm, and array of transmitters operating on various spot frequencies in the HF range 3-20 mc; among the station personnel to show visitors round was W6WET. The control stations for the Rally itself were G3NMS/A, putting out a very potent signal on Top Band, with some hundreds of contacts made during the week-end; G3HTC/A on two metres; and G8KW/A running the new K.W. Viceroy SSB transmitter on the HF bands. G3MZW (Deddington) was also most helpful and efficient on local talk-in. The Rally stations were located in what had been the airfield control tower, and so had excellent facilities for their antennae.

The organisation for this event, on which A.R.M.S. is to be congratulated, was in the hands of G3KVF, assisted by G3FPK, G3NMR and his XYL, while K7LKS was responsible for the excellent facilities provided by the U.S.A.F., by permission of Lt./Col. F. Harshfield, the local Base Commander, and Lt./Col. R. Halfman, C.O. of 1230 Air Communications Squadron, U.S. Air Force.



General view of the car park at Barford St. John, Oxon., for the A.R.M.S. Mobile Rally on June 19. The masts are part of the aerial array for the U.S.A.F. transmitting station in the far background.

* * * *

In spite of its distance from the main centres of activity, the meeting at Saundersfoot, Pembrokeshire, on June 25, drew a total attendance of 43, which included a strong contingent from the Llanelly and District Radio Club. The control station was GW2OP/A (operated by old timer Courtenay Price, none other) and he was kept busy during the afternoon, many stations being worked in Cornwall and North Devon, across the Bristol Channel, including G3LYW/M at Burnham-on-Sea.

* * * *

West of England Mobile Rally

Under perfect weather conditions for the third successive year the West of England Mobile Rally was held on June 26 in ideal surroundings on the Longleat Estate in Wiltshire, the home of the Marquis

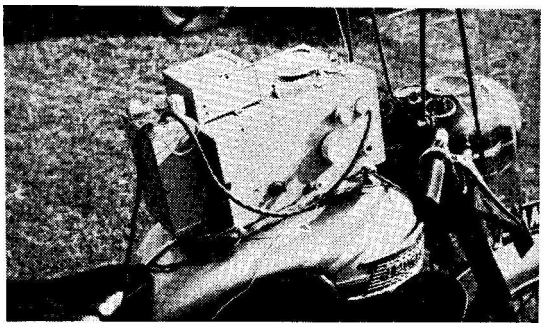
At the A.R.M.S. Rally on June 19: Left, John Savage, G3MSS, of Collins Radio of England, Ltd., with old timer G6WN.

of Bath. Organised by the Bristol Group under the chairmanship of G2FYT (who also acted as M.C.) this year's Rally attracted a record attendance and over 150 cars finally assembled in the car park beside the lake. The total attendance was estimated at well in excess of 500 and altogether about 135 licensed amateurs signed the attendance book; the visitors included ZS5QV from Durban.

G3CHW/A and G3FKO/A, the Top Band and two-metre control stations, were kept busy from 10 a.m. and with the majority equipped for 160m. operation, 48 mobiles in all were contacted by G3CHW/A whilst *en route* to Longleat. About 12 mobiles were worked by G3FKO/A on two metres.

The usual side-shows included a free draw, ladies' raffle and treasure hunt, with the added attraction this year of a DX balloon race! Although this report is being written before the closing date for the return of the tags, it can already be announced that at least two balloons have been found in France, so "propagation" conditions must have been quite favourable!

Lord Bath, accompanied by the Marchioness, presented the various prizes in person to the winners. He also presented the certificates which were awarded to the successful mobiles in the various competitions, including the *Concours d'Elegance*, won by G6IF/M

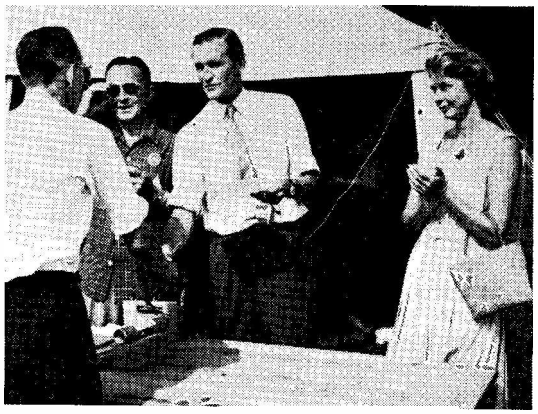


Seen at West of England Mobile Rally at Longleat — a mobile rig mounted on the tank of a Triumph motor-cycle.

with a magnificently-equipped Vauxhall Victor; the longest distance mobile-to-control contact on 160m, which went to G3ABU/M; the best mobile-to-control contact on two metres, won by G3HGE/M; and the mobile recording the highest field-strength reading on 160m, who was G6NW/M. The certificate for the mobile travelling the greatest distance to and from home on the day of the Rally was easily won by G3KCJ/M from Takely, Essex, who "clocked" well over 300 miles on the round trip. Special souvenirs of the event were produced by G6YA in the form of unique self-adhesive windscreen stickers of attractive design, which proved very popular.

* * * *

There were two Mobile Rallies on July 3. That at the little East Anglian seaside town of Hunstanton was a bucket-and-spade affair organised by the Peterborough & District Amateur Radio Society, with G3ANM/P as the local control station. On arrival,



The Marquis of Bath, accompanied by the Marchioness, presenting the prizes at the West of England Mobile Rally.

visitors were welcomed by G3JEC and G3KPO, and the total attendance was some 60 amateurs and SWL's, including G3JEQ and G3NFV, who came all the way from Surrey and gained the prizes for longest distance travelled. The other prize winners were G3KLC, G3CWV, G3HES, G3SZ and G2NJ.

* * * *

For the Rally organised by the Harlow & District Radio Society at Magdalen Laver, also on July 3, the attendance in the course of the day was estimated at 300-350 people, there being 120 vehicles in the park by lunch-time. Two control stations were provided by the Harlow group and the events on the ground included a display arranged by the Harlow Society of Model Engineers, and demonstrations of model aviation. In addition to the raffles, there was a balloon race, the results of which may not be known for some time. It was noticed that certain keen Top Band types were buying quantities of balloons to determine the lift that could be obtained for vertical long-wire aerials! As usual for these Harlow events much of the spade-work was done, and gear provided, by G3ERN, who is himself a well-known "feature" of many Mobile Rallies.

* * * *

South Shields Mobile Rally

This took place on July 10 in weather which was at first kind but as the afternoon went on it took a turn for the worse, and in fact the marquees and other equipment were removed from the site in a downpour of rain. The first arrival, at 9.0 a.m., was G3MQT/A, who had made the long journey from Hastings, Sussex, to the most northerly Rally in the U.K., a total distance of 717 miles travelled out and home! Without hesitation he was presented with the DX prize voucher. Other long-distance mobiles were G3JFH, Cheltenham; GM3HLQ, Strathaven; GM3ITC, Motherwell; G3KJF, Ayr; GM3GSC, Irvine; GM3NZC, Stewarton; and G2CDN from London, whose XYL presented the prizes.

In the driving competition, entrants had to manoeuvre round a carefully-planned course; the

winner, G3NCE/M, took away a 12v. car battery. The radio crossword and programme number competitions brought forth many useful and amusing prizes. The main raffles were divided into two, radio and non-radio, prizes in the former category including transistors, soldering irons, an ARRL *Handbook* and *Mobile Manual,* with numerous bundles of useful components.

The 160-metre talk-in station signed G3KZZ/A, using an Eddystone 680X and a K.W. Vanguard, and the longest distance contact was made by G3KQU/M. G2CDN, with the Club president G8AO, decided that taking into account safety, efficiency and general appearance, of all the /M rigs on view the best was that shown by G3JFH/M of Cheltenham—*see* p.209 June issue.

* * * *

The Mobile Rally meetings to take place from now until the end of the Season are as follows :

August 9-12 : During the period of the National Rally of Boats and supporting exhibition, the city of Stoke-on-Trent is co-operating with the Inland Waterways Association and, similarly, the Stoke-on-Trent Amateur Radio Society and S-o-T Boat Club are getting together on what will in effect be a Marine-Mobile Rally, the first to be held in this country. A station signing GB3SOT (the Stoke-on-Trent special callsign issued in connection with the city's golden jubilee celebrations) on 160-80-40 metres is being installed in the exhibition hall and, as many canal craft are expected to be converging on Stoke-on-Trent for the Rally, it is hoped to work, as /MM's or /MP's, those that may be fitted for amateur band operation. Berthing will be arranged on the old Newcastle-Stoke Canal, and full fuel, water and victualling facilities will be provided. Since it may take some boats several days to reach the meeting place, any U.K. amateurs who happen also to run canal craft (operation /MM on canals and inland waterways is covered by the mobile licence) are asked to get in touch with : V. J. Reynolds, G3COY, hon. secretary, Stoke-on-Trent Amateur Radio Society, 90 Prince's Road, Hartshill, Stoke-on-Trent, Staffs.

August 14 : Rally organised jointly by the Derby & District Amateur Radio Society and the Derby Short-Wave Experimental Society, to be held at Rykneld School, St. Albans Road, Derby (off Ring Road, Manor Road section), with talk-in by G3ERD/A on Top Band and G3EEO/A on two metres, opening at 10.0 a.m. Programme will include attractions for all visitors, with a radio controlled model aircraft demonstration, raffle, trade exhibition and mobile operator competition. The refreshment bar will open at 10.30 a.m., there is ample covered accommodation, and admission and parking are free. For any further details write : F. C. Ward, G2CVV, hon. secretary, Derby & District Amateur Radio Society, 5 Uplands Avenue, Littleover, Derby *21931.*

If you worked G3CHW/A on the way to the Rally at Longleat on June 26, this was the station.

On duty at the two-metre talk-in station G3FKO/A for the Longleat Rally — left to right, G3GYQ, G3FKO and SWL Gratton (whose father is G6GN of Bristol).

August 20 : Houghton-le-Spring & District Radio Club Mobile Rally, organised in connection with the Hetton Show, which is an important local occasion in Co. Durham. It includes such attractions as riding and jumping, the motor-cycle display team of the Royal Corps of Signals, and the events and competitions usually to be found at a country show. Talk-in by G3CKC/A on 1980 kc, from 10.15 a.m., with G3NMD/A on 40m. Lunch and tea will be available on the ground, which is at Easington Lane on the A.182, running between the A.19 and the A.690. There is an admission charge to the Show, and car window stickers can be obtained. There will be a free /M car park in the school grounds opposite the Show ground. For bookings and further information write, with s.a.e. to : S. L. McAteer, G3CKC, 20 Kirkdale Street, Low Moorsley, Hetton-le-Hole, Co. Durham.

August 28: Organised by the South Manchester Radio Club, in collaboration with the Stockport Radio Society, this Rally will be held in the Pavilion Gardens at Buxton, the Peak District beauty spot and health resort, with competitors in the treasure hunts (one for /M's and the other for non-mobiles) making their starts from the Davenport Cinema Car Park, Stockport. Thus, the Rally will be on the same lines as the successful event last year. The Pavilion Gardens at Buxton offer plenty of attractions for all visitors, and there are very good catering facilities, with ample covered accommodation. In addition to the usual radio events and activities, there will be a road safety exhibition and a radio trade display. Admission to the Gardens is 1s. per head, juniors 3d., and there will be a free reserved car park. Talk-in will be provided on Top Band and two metres, and further details regarding the mobile treasure hunts can be obtained from: C. M. Denny, G6DN, 18 Willoughby Avenue, Didsbury, Manchester.

The South Shields Mobile Rally, the most northerly in the U.K., was held on July 10. In this group are G2CDN/M (2nd from left), and G3JFH/M (2nd from right). Behind G2CDN and third from left is G3MQT/M, who did a return trip from Hastings of 717 miles specially for the Rally.

Photograph by courtesy "Shields Gazette"

September 18: Lincoln Short Wave Club Mobile Rally at the Technical College, Cathedral Street, assembling 1.30 p.m. onwards. There will be a lecture on the Applications of Transistors, with something more interesting for the XYL's ! Tickets at door will cost 8s., to include high tea, and there will be a surplus equipment sale. For further details write : Mrs. F. E. Woolley, G3LWY, Rochmount, Sturton Road, Saxilby, Lincoln.

AIR MARSHAL SIR RAYMUND HART

The untimely death of Air Marshal Sir Raymund Hart, K.B.E., C.B., M.C., A.R.C.S., M.I.E.E., M.Brit.I.R.E., and on retirement from the Royal Air Force director of the Radio Industry Council, will have come as a great shock to the many people who knew him inside and outside the Service. He died on July 16, at his home at Aston Rowant, Oxon., as the result of an accident. He was 61.

Raymund Hart was a Signals officer of great distinction and, by those who know the background facts, will be particularly remembered for his great technical contribution to the R.A.F. war-time fighter organisation, for which he was mainly responsible. It was this organisation which—given the pilots and aircraft—more than any other single factor won for us the Battle of Britain. For the method of fighter control that he evolved, depending on radar sighting and ground-air radio communication, not only trebled our effective fighter potential, but enabled pilots to be directed on to their targets. Goering's mistake when he was directing the Luftwaffe in the Battle of Britain was in evaluating our fighter defence in terms only of known numbers of aircraft and pilots; he did not know that, because of the fighter control system evolved by Hart, we had no need to fly standing defensive patrols—with all the waste of effort that they would have entailed—nor that his attacking bombers were found accurately from the ground and not by chance sightings by aircraft roaming about in the sky. Thus, the squadrons of Fighter Command could be used in the most economical and effective way possible. An interesting sidelight on this is that later in the war, when the Luftwaffe had to defend Germany against R.A.F. Bomber Command, they used a fighter control system very similar to our own.

Raymund Hart, who joined the Royal Air Force in 1917 when it was the Royal Flying Corps and on his retirement in February last year was the only remaining R.F.C. pilot on the active list, was essentially a practical radio man, well able to "mend the set" himself if things went wrong in an emergency, which was often in those hectic days. For all his great distinction, he was a modest and very approachable man, who never forgot his friends or those who, however junior, had helped and encouraged him in the difficult days of getting the Fighter Command signals organisation on to a sound operational basis.

And because he was a practical man himself, Sir Raymund Hart understood Amateur Radio and radio

amateurs, for whom he had a sincere respect. Many of his war-time staff were holders of callsigns who, for all their sudden transformation into R.A.F.V.R. uniform, were found to be quite capable of coping with unfamiliar equipment at remote out-stations, and looking after the administration as well. Sir Raymund was often to be seen at post-war Amateur Radio functions, and in 1958 he opened that year's Amateur Radio Exhibition.

In the ordinary way, he would have had many years of useful life to which to look forward, and it is a tragedy that he should have died as the result of a simple domestic accident, with an electric lawn-mower.

A.J.F.

LOCAL SOUND BROADCASTING

The charters under which Sound and TV broadcasting are at present being carried on in this country (BBC and ITA) expire in 1964, and between now and then there is to be an Inquiry to establish the future pattern of public entertainment by sound and vision. This will give certain interests the opportunity to advocate the claims of commercial firms wishing to establish local sound-broadcasting stations to be supported by advertising. The present idea is that comparatively low-power transmitters should be operated on the medium-wave band, congestion not being a serious factor because the range will be local only, and within this service area the signal will always be strong enough to over-ride any distant interference—in fact, on exactly the same principle as our Top Band nets are operated. According to one estimate discussed in the public print, it should be possible to establish a local medium-wave broadcaster "for as little as £20,000." Since all that would be required is a two-room office suite, a couple of tape recorders, a transmitter consisting of CO 6L6-6L6 driving an 813, a modulator to give about 150 watts of audio, and a 50 ft. mast to hang the aerial on, this figure of £20,000 would seem to be an outside estimate, even for 1964! If the project fructifies, we hope that the smaller radio firms up and down the country, many of which are run by licensed amateurs and would be quite capable of supplying all the equipment, will be on the *qui vive* to get their share of the pickings. That there will be some nice business to be done is suggested by the fact that some 50 companies for local sound broadcasting have already been registered.

FINDING THE MARKET

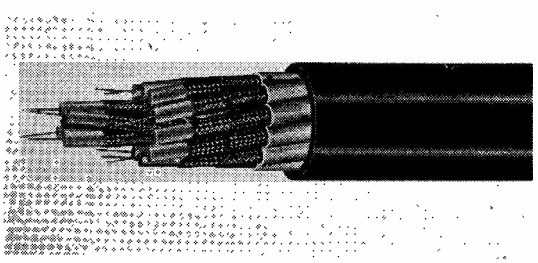
The following was on a post-card dropped through our letter-box the other morning: *"Congratulations on the excellent Small Advertisement section of your Magazine. Completely sold all my station except for the Rx. Have been bombarded by letters and callers."* This refers to the advertisement by a Lancs. reader which appeared in the July issue of SHORT WAVE MAGAZINE, published on July 1st; his card is dated July 8, and he adds that he was sold out in three days. So, if you have any good equipment to get rid of at a reasonable price, you cannot do better than use the Small Advertisement columns of the *Magazine*. The rate for readers' own advertisements is only 3d. a word, with a minimum charge of 5s. Notices should be clearly written, using the accepted abbreviations and sent, with remittance, to the Advertising Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

ANOTHER PIRACY PROSECUTION

According to the *Lincolnshire Echo* for July 19, two Lincoln boys were successfully prosecuted by the Post Office for operating without a licence and interfering with Humber Radio on 2182 kc. The culprits admitted that they "had begun transmitting about November last year," and had been joined by a third unlicensed operator. The G.P.O. made a strong case, but the defending solicitor was able to convince the Court that their offences had been no more than technical! They were, he said, keen radio apprentices, bright enough to build their own equipment. Whereat the lady magistrate presiding announced a fine of £3 each and said that the bench had, after all, decided not to confiscate their equipment!

ORGANISING R.A.E. COURSES

Though we publish essential details of all courses for the Radio Amateurs' Examination which are notified to us, these are not necessarily the only such courses available. Readers wishing to take a course should enquire of their local Technical College or Education Authority whether anything has yet been arranged locally. If not, the authority concerned will usually be glad to organise a course if sufficient numbers can be enrolled; a minimum of 12, but sometimes six, students is normally required. In most large centres of population, this is easily possible, and an announcement in the local paper will find them; it often happens that there are far more people wanting to take a course than know how to set about joining one. As such courses come within the planning for further education under the local authority, fees are nominal. Local club groups can do very valuable work in negotiating with their education authority. In such negotiations or enquiries, always quote the Radio Amateurs' Examination, Subject No. 55 in the City & Guilds of London Institute's examination series—and *see* p.298.



For the BBC's new TV Centre at White City, British Insulated Callender's Cables, Ltd. have supplied 17,000 feet of 14-way coaxial cabling; this was manufactured to BBC specification, for a mean impedance of 75 ohms. In addition, the contract called for 180,000 feet of single coax for video distribution.

ROLLING YOUR OWN COILS

FOR USE AT RADIO FREQUENCIES —DESIGN AND PRACTICE FOR THE CONSTRUCTOR

J. B. Dance, M.Sc.

MANY constructors who would like to make their own coils are prevented from doing so because of lack of knowledge about coil design. Whilst the design of very high-Q coils is undoubtedly fairly difficult, it is nevertheless possible for the average enthusiast to design and make coils for almost all purposes.

The number of turns required on a coil depends not only on the required inductance, but also on the length of the coil, the diameter of its former and the depth of the wire on the former. If the coil is not air cored, the material of which the core is made also affects the inductance.

Formula Used

There is no reasonably simple exact relationship between the number of turns and the inductance of a coil, but the following formula for air cored coils is accurate to a few per cent. and is perfectly satisfactory for all normal work which does not require great accuracy.

$$N = \frac{1}{D}\sqrt{\frac{3D + 9B + 10T}{0{\cdot}2}\,L}$$

(where—*see* Fig. 1):—

N is the number of turns.
D is the mean diameter of the coil winding in inches.
B is the winding length in inches.
T is the thickness or depth of the winding measured radially.
L is the inductance in microhenrys.

In the case of single-layer coils, the thickness of the winding, T, may be neglected and the mean diameter of the winding can be taken as equal to the diameter of the former.

A normal iron-dust core in the half-way position increases the inductance of a coil by about 18%. As the number of turns depends on the square root of the inductance, the number of turns on a coil containing an iron-dust core should be about 9% less than on a similar coil of the same inductance without the dust core. The use of a dust core allows the inductance of a coil to be altered by about ± 18% and generally enables a coil of higher Q to be constructed.

The use of this formula can be illustrated by two practical examples, one of which deals with the design of single-layer coils and the other of multi-layer coils intended for use in tuned circuits.

Single Layer Coils

Let us assume that it is desired to construct RF coils for use in a radio receiver or signal generator using a tuning capacity whose nominal value is 300 $\mu\mu$F. Let it also be taken that the lowest frequency of the required range is 5 mc (corresponding to a wavelength of 60 metres). The required inductance of the coils can be calculated from the equation:—

$$L = \frac{25330}{f^2C}$$

where f is the frequency in megacycles,
C is the capacitance in $\mu\mu$F,
L is the inductance in microhenrys.

If we take into account added strays, the maximum capacitance will be about 330 to 340 $\mu\mu$F. Putting the values C = 330 and f = 5 into the equation, a value of 3 microhenrys is obtained for the inductance of the coils. This inductance value may now be used in the same equation together with the estimated value of the minimum capacity (including strays and trimmer, not more than 40 $\mu\mu$F) in order to calculate the maximum frequency of the range (14·5 mc, or about 20 metres).

The 3 microhenry coil for use at frequencies of 5 mc and above will consist of a single layer of wire, and each turn of wire should be spaced from adjacent turns so that the stray capacitance is reduced to a minimum. The spacing must not be too large, however, or the coils will be too long to have the highest Q value. Generally, each turn should be placed about one wire diameter or a little less from each adjacent turn. It is usually desirable that the diameter of the coil should be of the same order as its length. Let us assume that both diameter and length are 0·5 inches. Therefore B = D = 0·5 is substituted in the equation:—

$$N = \frac{1}{D}\sqrt{\frac{3D + 9B + 10T}{0{\cdot}2}\,L}$$

T is negligible, as the coil will have only one layer, and, *therefore*

$$N = 2\sqrt{\frac{1{\cdot}5 + 4{\cdot}5}{0{\cdot}2} \times 3} = 19 \text{ turns approx.}$$

The 19 turns should be evenly spaced over the half-inch winding length. Wire tables show that 26 to 30 SWG wire is suitable, because this will allow spacing between adjacent turns. Enamelled copper wire can be used for single-layer coils unless they are to be used above about 25 mc, in which case the outside of the wire should be made of a very good conductor; tinned wire or, better still, silver-plated wire is then used. However, enamelled copper wire is perfectly satisfactory for the 3 microhenry coil in the foregoing problem.

If the coil is to have an iron-dust core, the number of turns should be reduced by about 9%. That is the number of turns to be used with the dust core = 19 × 91/100 = approx. 17 turns. This

gives the desired value of inductance with the core about half-way in.

Multi-layer Coils

Many more turns are required for a coil which will be used at medium-wave frequencies of the order of 1 mc, or 300 metres. Single-layer coils are not, therefore, practicable. If a tuning condenser of nominal capacity 300 $\mu\mu$F is also used for a medium-wave range covering approximately 0·52 to 1·55 mc, the required inductance of the coil can be shown to be about 275 microhenrys by the same method as was used in the first example.

Let us assume that the coil diameter is to be 0·4 inch and the length of the coil winding 0·25 inch. The thickness of the winding will depend on the thickness of the wire, whilst the optimum value of the latter depends on the number of turns. It is therefore necessary to assume a reasonable thickness for the coil winding (say, 1/10 of an inch). The actual thickness can be found after the coil has been wound, and any slight correction to the number of turns due to the winding depth not being exactly 1/10 of an inch can then be made if necessary.

The mean diameter of the coil will be the diameter of the former, plus the thickness of the winding, *i.e.* D = 0·5 inch. Substituting this value together with B = 0·25 and T = 0·1 in the equation used previously, the following equation is obtained:

$$N = 2\sqrt{\frac{1{\cdot}5+2{\cdot}25+1{\cdot}0}{0{\cdot}2} \times 275} = 162 \text{ turns approx.}$$

This value is for use *without* a dust core. When a dust core is used, the number of turns will be 162 × 91/100 = 147 turns approx.

In order to reduce stray capacitance, the wire used in multi-layer coils should be silk-covered. The gauge must be chosen according to the particular coil being wound, 30 to 36g. silk-covered enamelled copper wire being suitable for most medium-wave coils. It is possible to obtain higher Q values for coils operating between the limits of 100 kc to 3 mc by using Litz wire. (This consists of a number of fine strands of enamelled wire insulated from each other and has a lower effective resistance between the frequencies mentioned than single-strand wire.) The effective resistance of single-strand wire is high because of the "skin effect," which causes the current to travel on the surface of the wire. Nevertheless, the improvement obtained by the use of Litz wire is not extremely great and is counteracted somewhat by its larger diameter.

The best way of winding multi-layer coils is known as *wave winding*. Each wire crosses over the wire underneath it at approximately right-angles, and the stray capacitance is therefore kept at a minimum. A wave-winding machine is almost essential in order to make a neat wave-wound coil, however, and therefore most amateurs can only attempt to wind a coil in such a way that the closest approximation to wave winding is obtained. Alternatively, the wire may be wound on in a random manner, the wire being moved quickly from side to side during winding. This method is called scramble winding. The final appearance of the coil is much better if it is positioned between two suitable cheeks, with a solution of polystyrene in a volatile solvent applied to maintain the wire in position.

Coupling Coils

The above examples refer mainly to the design of the tuned windings of the coils. It is usual in the signal frequency circuits of radio receivers to wind another coil on to the same former as the tuned winding for the purpose of supplying signal voltages to the tuned circuit (magnetic coupling). This untuned coil is the primary or coupling coil. The number of turns on the coupling coil and its distance from the tuned coil determine the amount of coupling. When the two coils are close together, the amount of coupling is large and the circuits are said to be tightly or close-coupled. Loose coupling occurs with the coils spaced well away from each other.

The design and adjustment of coupled circuits is, for the amateur, very much a matter of trial and error. Expensive measuring equipment is required to obtain data for use in calculations on coupled circuits, but satisfactory results can be obtained if the basic principles are understood. If the coupling is too tight, some of the resistance in the primary circuit will be coupled into the tuned circuit, thereby lowering the Q of the latter. If the coupling is too loose, the amplification of the circuits will be smaller than it need have been.

In the RF stages of radio receivers and signal generators, satisfactory results can be obtained by winding each coupling coil with about one-sixth to one-third of the number of turns of which the coil in the corresponding *tuned* circuit consists. The coupling in the aerial coils of receivers should be considerably less than in the inter-valve RF coils. The spacing between the coils should generally be fairly small, but not so small that the selectivity of the RF stages is reduced, as this may lead to image interference in superhet receivers. In the case of receivers used at frequencies above about 20 mc, however, the aerial coil coupling is usually made greater than that which gives best RF selectivity in order to obtain the best signal-to-noise ratio. The coupling coil may even be interwound with the tuned coil to increase the coupling coefficient. The coupling coil should be nearest the chassis.

IF Transformers

Transformers for IF applications normally consist of two tuned circuits and the coupling is therefore very much less than is required when only one circuit is tuned. This is why the spacing between the (untuned) coupling coil and tuned coil in RF circuits is usually of the order of one-tenth of an inch whilst the spacing between the two tuned windings of an IF transformer is usually somewhat over one inch. Generally, permeability-tuned trans-

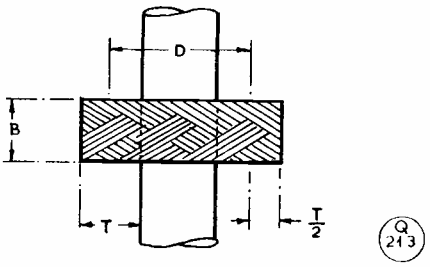


Fig. 1. The dimensions referred to by the author in describing how coil sizes can be worked out.

formers are the most satisfactory. It is usually possible to obtain extremely cheap "surplus" transformers which can be rewound for the frequency desired. The two identical coils of the tuned circuits should be constructed on the principles described previously, and it should be possible to slip one of the coils along the former in order to alter the coupling. Except for intermediate frequencies above 4 mc, multi-layer coils are used and an improved Q is normally obtainable by the use of Litz wire. The parallel tuning condensers should normally be at least 100 $\mu\mu$F, so that small variations in the stray capacitance of the circuit do not alter the resonant frequency appreciably. Unless the resonant frequency is below 150 kc, it is not usually wise to use fixed tuning condensers in excess of 200 $\mu\mu$F or it will not be possible to obtain the maximum Q.

If the coupling between the two tuned circuits of the transformer is very loose, a response curve like curve A in Fig. 2 will be obtained. The output increases with increase of coupling until it reaches a maximum at critical coupling, as shown in curve B. The output at resonance then decreases with further increase of coupling as shown in curve C, this curve being broader and having two separate *maxima*. When the coupling is above critical, the tighter the coupling, the less is the selectivity. As the Q of the circuit is increased, the amount of coupling required to reach critical coupling becomes smaller.

In the IF transformers of communications receivers the coupling is often critical or even slightly less than critical in order to obtain maximum selectivity. The coupling between two IF circuits may be adjusted for maximum selectivity by making the spacing between the two coils slightly greater than that which gives maximum gain. In the case of broadcast receivers, however, the coupling is sometimes made greater than critical so that the response curve is broad enough to give the greater bandwidth desired for somewhat higher fidelity reproduction. An alternative method of producing a broad selectivity reponse curve is to adjust the two tuned circuits of the transformer to two slightly different frequencies; this will give a double humped response curve even when the coupling is below critical. The circuits are then said to be stagger tuned.

The design of special IF transformers such as

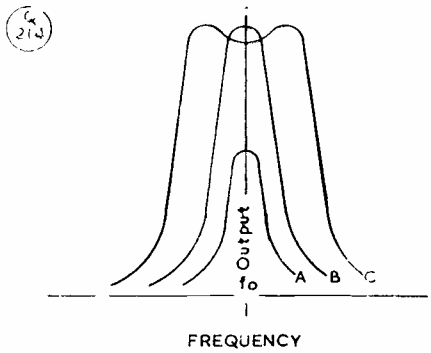


Fig. 2. Showing IF transformer response curves. Curve (A) is for coupling less than critical; (B) is the critical coupling; and (C) shows over-coupling.

those in which the windings are totally enclosed in iron dust and those in which a method of coupling other than magnetic is employed is beyond the scope of this article.

Oscillator Coils

In superhet receivers the values of the oscillator inductance and padder capacity which are necessary for good tracking may be calculated by using one of the (rather complex) formulæ given in radio design handbooks. It is then merely necessary to wind a coil of the appropriate inductance and adjust the coupling so that the correct oscillator voltage is fed to the particular type of mixer valve used.

The practical method of designing coils is, therefore, the use of an equation for determining the number of turns combined with some approximations—and much common sense. Even if the problem is not thought out too well, a reasonably satisfactory coil will most likely be obtained, although it may have a somewhat lower Q than would be expected. It is possible to get much satisfaction by making one's own coils—and after having tackled the problem successfully, the keen constructor soon acquires the knack of producing good coils quickly and easily.

R.A.F.A.R.S. MEMBERSHIP

The June 1960 issue of *QRV*, journal of the Royal Air Force Amateur Radio Society, prints a full membership list of R.A.F.A.R.S. From this we see that the Society now has 288 licensed-amateur members in 19 countries. All who have, or have had, any association with the Service are eligible to join. Apply Hon. Secretary, R.A.F. Amateur Radio Society, R.A.F. Station Locking, Weston-s-Mare, Somerset. The Society operates its own Hq. station G8FC from Locking, on all HF bands.

ORDERING AMERICAN MAGAZINES

With the notes about *QST* and *CQ Magazine* on p.270 of the July issue, we should have mentioned that we can also accept subscription renewals for them, at the rate of 43s. for *QST* and 44s. for *CQ*. Delivery is by surface mail direct from America,

VHF BANDS

A. J. DEVON

Surveying Latest Results—

Interesting VHFCC Elections—

Reports, Notes and News—

THOUGH there is quite a lot to discuss, it has not been much of a month as regards DX conditions—for one thing, the weather has been all against any opening developing, and that in turn has tended to restrict activity, which has meant that such opportunities as there were have not been fully exploited. One of these was on June 25, when the GM's were workable by tropospheric propagation.

The barometric trace suggests fairly stable "average" conditions during the early part of the period (which includes June 25) until about the first week-end in July, after which there were pronounced irregularities, with the pressure low generally. So far as the barometer is a guide to DX on VHF, a recording of this sort suggests pretty poor conditions—and your A.J.D. had no qualms about missing much while away on a trifle of leave.

One of the interesting events during the period was the field-day contest on July 3, for which the weather was merciful and the propagation conditions fairly good. The activity was up to about the level usual for these affairs, there being around 40 /P stations available and perhaps 60 fixed stations—these are estimates, based on reports and scores, for the country as a whole. Conditions for EU working were poor and though not many contacts were made across the Channel, G3DIV/P did succeed in getting a DJ portable. Interesting stations heard, and worked by many, included GC2FZC, GD3JZN/P and GW3HYH/P. One of the high scorers was G2HIF/P, with a total of 85 fixed and portable stations worked; some other scores noted were G3AZT/P with 60, G3MI/P with 57, and G3GKH/P with 54 (and a pronounced generator roar!). GD3JZN/P had made 40 contacts by about an hour before the close. G3FD/P worked 33 portables, five mobiles and 22 fixed stations for their total count of 60 contacts. Among stations making a welcome appearance, or re-appearance, on the two-metre band were G3BLP, G5MA and G5YV.

When G5YV came on, he was able to work southerly stations quite easily, but for many /P operators the last hour or so of the contest was rather slow, as by then most stations had been worked through. On some occasions, the concluding stages of a contest are hectic, as fixed stations start appearing "to give a few points." (This is an old gamesmanship manœuvre, as it guarantees *(a)* being wanted, and therefore *(b)* getting contacts!). As an example of an average scoring rate in this particular contest, G3JZW/P made about 30 QSO's in the four hours 1300-1700, but in the last two hours had only 12 contacts.

VHFCC Elections

Quite a number of interesting ones this month, starting with I. Cline, G3EMU, of Canterbury, who gains VHFCC Certificate No. 268; his claim is unique in that he is the first U.K. operator to get his VHFCC by showing EU cards only, with the exception of one from G8AO/MM (who, as far as we can remember, has never featured in a VHFCC claim before!). G3EMU's tally is made up of seven F's, 18 ON's, one OZ, 55 PA's, one SM, 17 DJ/DL's—and G8AO/MM. Of course, G3EMU would be the first to admit that he is better placed for working Europeans than almost any other G (look at the map) and his claim proves that he makes full use of the opportunity; his Tx runs 100w. with push-pull 6146's, the receiver is EC91-EC91-ECC81 into an S.640, and the beam is a pair of slots, ½-wave stacked.

Certificate No. 269 goes to Ivo Chladek, OK2VCG of Brno, whose claim includes *no* G's worked; his cards are from nine European countries, and among them are 73 OK's and 9 OE's; curiously, he shows only seven from DJ/DL/DM. With this claim, we also had one from Eugen Spacek, OK3YY of Bratislava, whose VHFCC Certificate is No. 270, and is likewise without any G's worked; his cards come from DL/DM, HA/HG, OE (17), OK (65), SP and YU.

L. Hardie, GM2FHH, of Aberdeen, is a well-known VHF/DX operator who could have claimed his VHFCC some time ago; he gets Certificate No. 271, with cards listed from 10 countries; the first QSL in his batch is dated 3/9/51.

The latest Londoner to gain VHFCC is J. L. De Leeuw, G2BDX, of Woodside Park, N.12, who shows 96 G cards and four EU's; he runs an 832 PA, his receiver is a BC-342 with a 3-stage converter, and the aerial is a slot at 25ft. His Certificate is No. 272.

Lastly in this batch, we have a most interesting claim from HG5KBP, Budapest, which is actually the VHF station at the Hq. of the Hungarian Central Radio Club. All the cards they show are for contacts with Iron-Curtain countries, including 14 stations in the USSR itself; of the six countries worked, OK gave them 38 stations and Hungary itself 37—incidentally, all with the HG prefix. From the general nature of the claim, for which they get Certificate No. 273, it would seem that HG5KBP would be well worth co-opting on any special DX tests; the correspondence is in English, and the "head man" is evidently HA5BI, P.O. Box 185, Budapest, 4.

From these European claims, and the details on the cards themselves, it is evident that the gear

used is in general very similar to our own ; it is also clear that there is plenty of VHF activity in several countries not yet worked from the U.K.

Four-Metre Band

One report at least on what is at once a potentially very useful and interesting, but also much-neglected, band. G3JHM (Worthing) runs 20w. on 70·32 mc, with a CC converter into an AR88, and a 4/4 slot-fed ; with this equipment, he worked FA9VN, nr Oran, on July 2, with 589 reports both ways ; FA3JR was also heard. G3JHM says that FA9VN always tunes over 70 mc for G stations. Due to the propagation characteristic likely to develop for long-distance working on 4 metres, when the DX does come through it will usually be there in the afternoon, with strong peak signals. G3JHM has also worked G2JF and G3FEX on 70 mc. There are about half-a-dozen other stations known to be on, or potentially available, including G3EHY and G5YV.

TWO METRES

COUNTIES WORKED SINCE SEPTEMBER 1, 1959

Starting Figure, 14

From Home QTH Only

Worked	Station
52	G3HBW
49	G5MA
48	G3LTF
47	G2CIW
41	G6XA
40	G3NBQ
38	G3JWQ
34	G3KPT, G3LAR
30	G3AYC, G5ML
29	G3GSO, GW3ATM
27	G3HWR
24	G3MPS, GW3MFY,
18	G3CO, G3ICO G3OBB, G3OBD, G8NM
14	G3DLU, G3IOE

This Annual Counties Worked Table opened on September 1st, 1959, and will close on August 31st, 1960. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. Final claims should reach us by September 21st for the summary to appear in October. The new Table starts w.e.f. September 1st.

Two-Metre Notes

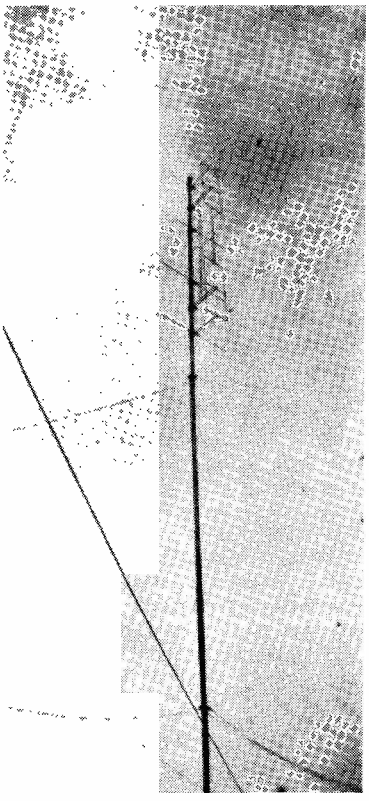
G3OBD (Poole) has got into six more counties, with G3ILX of Barrow-in-Furness as best DX—and nice DX that is, too. During the field day on July 3, he worked 12 stations in ten counties while testing the new mobile rig.

G6XA (Leamington Spa) moves well in the Tables, and gets into Countries with 8C ; on 70 centimetres he mentions G2FNW, G3ENY, G3IRA and G6NB, each worth a county to him on that band. G3JWQ (Ripley) has worked 32 new stations since last reporting, and now stands at 493S on that ladder ; his other marathon is the schedule with G8VZ—they have now had more than 1,000 QSO's, the count as at July 16 being 1,024 (which would be a good figure for the barometric pressure, as Tony says !).

Bob of G5MA (Great Bookham, Sy.) remarks that he is " fortunate to have made a few GDX contacts during the month "—these amount to no less than four GM's during the tropospheric opening of June 25, " all solid CW," and GD3UB. Other good contacts mentioned, also CW and later in the period, include G3FYR, G3ILD and G2FO (Co. Durham), G3ILX, G3HII/P in Westmorland, GW2HIY for Anglesey and GW3LJP in Llandrindod Wells for Radnorshire. These help to put Bob at 49C for the Annual.

G3OBB (Christchurch) gets four more for the Counties tables, including G3EKX in Derby, and has also worked F3LP for his first French station. G2CIW (Birmingham) worked G3ILD, GI5AJ and GM3EGW early in the period, but missed such chances as there were later on due to being on holiday. G3LTF (Danbury) says that so far this year conditions have been well down on last ; he is still looking for GD and EI to complete the " local countries " worked.

For GM2FHH up in Aberdeen, the only real DX openings this season have been *via* Aurora, on which he usually does very well. He says that there is more potential VHF activity in the area —GM3FKS and GM3NOV are on, GM5YK is getting ready, and some of the other locals are also busy building the gear. They can all be sure that their appearance on the band will be very welcome, even if they do have to wait some time for a GDX opening.



A pair of Slots with reflectors, at a mean height of 40 ft., looks like thin. The array is a standard J-Beam desigs for two metres.

G3MPS (Farnborough, Hants.) puts in claims, and mentions that he is going QRO on two metres with a 4X150A in the PA ; a new 70-cm Tx is also in hand, which will have a QQVO3-20A on 217·5 mc driving a 4X150A as PA-doubler to 435 mc ; this is to have a coax cavity in the tank, and the nett effect should be about 40w. RF output available on 70 cm. G3MPS has completed a new converter for the 430 mc band (always get the Rx done first !) consisting of a 6AM4 trough-line RF stage into a CV2154 crystal mixer, with ECC84 cascode IF head amplifier, the CO chain being 6J6-6J6-6AF4A with a cavity in the last stage. Needless to say, G3MPS also has a suitable two-band aerial system, which we hope

to show in a later issue. He remarks that local activity is quite good, with a Friday-night net which includes G3KND, G4PS, G5NF, himself and, recently, G3FKO and G3GYQ; any others who can join will be welcomed. All this happens from about 9.30 p.m., around 144·9 mc.

During the June 25 opening, G3JHM (Worthing) worked F8MW and F9NW, also F8LO and F9II in Paris; F3LP and F9NW were raised on July 3, when F8GH, F8OB and F9QW were heard.

Another Meteor Schedule

G3JHM has arranged a meteor schedule with OK2VCG for the Perseids appearance during August 12-14, times being (GMT): August 12, 2100-2359; August 13/14, 2300-0100. G3JHM will be running 600w. to an 8/8 slot fed; he is particularly interested in meteor attempts with any DX station at 475-1200 miles distant, and able to put plenty of power into a good beam.

Note that for this Perseids schedule, OK2VCG will be on 144·412 mc; if you can set up this frequency accurately on your receiver, it would be worth listening for him at the times given. We would be very interested to have reports from anyone able to identify OK2VCG on this test. He will, of course, be attempting to QSO G3JHM and, as the Perseids density is comparatively high, they have a good chance of making contact.

GW3MFY (Bridgend) reports for the Tables, and mentions an Aurora contact with GM3FGJ; another good QSO for him was with G3CCH, for Lincs. G8NM (Lincoln City) puts us right on Table positions, as do G3HWR and G3KEQ.

Successful Showing

An interesting letter from G3AOS reports results with GB3UHF, the station run by the North-West VHF Group for the electronics exhibition in Manchester during July 7-13; not only did they have a large number of visitors (in fact, it was like an Amateur Radio convention at the week-end), but they also did very well on two metres. Something like 190 contacts were made, many stations coming on, and mobiles going out, specially to work them. Their great experience was to find that, though in the centre of the city, two metres was comfortable with a quiet background at times when the HF bands were unworkable due to the very high local noise level. For GB3UHF, they had a two-metre 4/4, slot-fed, at a height of 150ft., fed with special low-loss cable loaned by the manufacturers for the purpose: the length of cable used was estimated to have a loss of only 2 dB. Undoubtedly, it was this aerial and its feeder system that made the GB3UHF results possible—height above the noise zone being the factor that mattered.

All GB3UHF contacts are being QSL'd by a special card, though it may take a little time to get them all out. G3AOS also says that the Group hopes to be invited to the exhibition again next year—with a little more time to prepare for it!

Further Reports

We were glad to hear from G3NWG (London, S.W.18) who has been on two metres for about eight months; from a poor location "just above sea-level," with 16w. and a 5-ele flat-top at 28ft., he has worked 150 stations in 15C, operating at week-ends only; he is on 144·9 mc but can move about in the Zone if necessary. He mentions two other London stations: G3MLE, 144·7 mc, near the Planetarium, badly screened in all directions, and using a teminated-V with 30w.; and G3KPB, in S.W.18, who has recently come on with a 6/6 at 30ft. and 35w. input, to be increased when an 829 PA has been completed.

G5ZT (Plymouth) worked 14S on July 3, including GD3JZN/P for a very fine 459 both-ways contact; it made up for the F station he had lost a few minutes before; G5ZT says he will be /M shortly. G3CZZ (Camborne, Cornwall), active again after a long break, is on 144·08 mc, and mentions four mobiles worked during their holidays in the district; he has also had contacts with G3FYR, G6GN and GW3MFY. Stations heard include G5ZT, G8DA, G8UH/M (on holiday) and GW3ATM.

The wanderlust has got Harold of G5YV; he and G3JWQ will be going off portable "in several counties in North Wales, during August 15-22, working both VHF bands, 8.0-11.0 p.m. clock time daily." GW3NGK/M expects to be in Llandudno for August 13-27, and will want contacts.

In Conclusion

Deadline for the next issue is **August 18**; address it all to: A. J. Devon, "VHF Bands" *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Till then, *73 de A.J.D.*

SEVENTY CENTIMETRES

ALL-TIME COUNTIES WORKED

Starting Figure, 4

Worked	Station
32	G2XV
28	G3HBW
27	G3JWQ, G3KEQ, G5YV
26	G6NF, GW2ADZ
23	G3BKQ, G6NB
20	G3HAZ
19	G2CIW
18	G3IOO, G2CIW*
16	G2DDD, G3LHA, G3MED
15	G4RO
14	G2HDZ, G3FAN, G3KPT
13	G3MPS
12	*G5BD*
11	G3LTF
10	G2OI, G3AYC, G3IRW
9	G5DS
8	G6XA
7	G2HDY, G3JHM
6	G3JMA, G3KHA, G3WW
5	G3FUL, G3IRA, G3IUD, G5ML
4	G3JGY

On working four Counties or more on the 70-Centimetre band, a list showing stations and counties should be sent in for this Table, and thereafter new counties worked notified as they accrue

* New QTH

BCI ON AUDIO AMPLIFIERS

CURING PICK-UP INTERFERENCE

E. A. Knight (G2LP)

The effect discussed in this article is a well-known form of RF break-through interference and, at the first attempt, can appear very difficult to cure. It is not always direct pick-up at the front end of the amplifier that is the trouble; as our contributor explains, speaker extension leads can act as an aerial.—Editor.

HAVING experienced some cases of BCI (or should it be Hi/Fi/I ?) of recent date, the writer believes that there must be many more instances where this form of break-through interference can occur.

The transmission from G2LP was being picked up by extension loud speaker leads acting as an aerial, the signal being fed back to the amplifier input stage *via* the negative feed-back loop. The signal was most probably rectified in the first amplifier stage, although it could well be a later stage, acting as a grid leak or anode bend detector. An amplifier employing grid current bias, or a stage operated as a starved high-gain amplifier, is most prone to this form of interference.

A short while ago the writer was notified of a case where G2LP was breaking through on a VHF FM Tuner/Amplifier high-quality receiver combination; the set was located at a distance of about 200 yards from the transmitter. More recently, another case has occurred with a similar receiver arrangement, although the equipment in this instance was manufactured by a different firm; again the distance of the set was about 200 yards. The cure was so simple, and confined to the Hi/Fi amplifiers in both cases, that it is hoped the following information will be of assistance to anyone finding themselves facing similar complaints.

The transmitter was operating at the time on the 80-metre band and is fitted with the usual pi-section output circuit. It has been checked for spurious emission at VHF, and given a clean bill in this direction. Powers up to 150 watts are used, with plate-and-screen modulation of an 813 in the PA.

The first case of break-through was a receiver employing a well-known make of FM tuner and a 3-watt quality amplifier of the type that is freely available on the home-constructor market, either as a kit, or sold as a completed unit. The transmitter broke through irrespective of where the receiver controls were placed, and it was noticed than an extension loud speaker was in use. A test was made in removing the radio input plug to the amplifier, but the break-through was still there. So it was decided to try an RF filter in the extension loud speaker line. This filter completely cured the trouble.

When the second case of this sort of break-through occurred, the co-operation of the owner of this FM/Amplifier combination was sought; he was asked to try the removal in turn of the aerial, input plug to the amplifier, and the extension loud speaker. This test immediately showed that the extension LS leads were again picking up the transmission. The interference ceased entirely when the remote LS line was disconnected from the amplifier socket, leaving only the local speaker in operation. A similar filter as before was fitted and completely overcame the trouble.

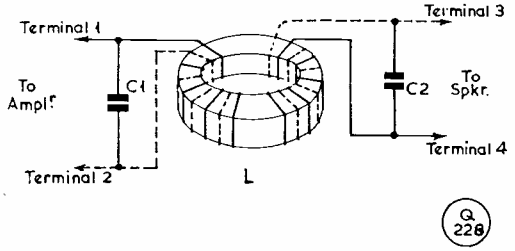
Design of Filter

The filter was evolved from the requirement that a high RF impedance is necessary in *both* LS lines to prevent RF pick-up, but not *between* the lines. It is also desirable that the amplifier should not be "made aware" of any changed conditions when the filter is introduced into the output lines. A bifilar choke meets this requirement most nearly, and can be a labour-saving device, as both pairs of wires can be wound on at the same time—*see* sketch. As a further means of obtaining a reasonable inductance figure without too many turns of wire being required, a ferrite ring can conveniently be used. A suitable pattern in the Mullard components range is part number FX1588 grade B. The dimensions of this ring are: $1\frac{1}{2}$ inches o.d. by one inch i.d. by $\frac{1}{4}$-inch thick. It was found that 50 turns was ample on this ring, *i.e.* 50 twin turns, which produced an inductance value of approximately 0·3 mH. The wire used was stranded plastic covered 14/006, but the gauge of wire is not critical. It must be remembered that both beginnings, or both ends, must connect to either the amplifier output terminals or the LS unit and not one end and one beginning.

So there we have it. Just 50 turns, wound bifilar as in the diagram, and the two ·01 μF condensers joined across the filter to ensure RF balance. The leakage inductance, with one pair of terminals shorted, is ·003 mH.

For interest, it can be shown that the RF impedance at, say, 3·6 mc is about 6800 ohms, while the amplifier "see's" an inductance of only 0·003 mH. So at, say, 10 kc (in the audio range) the series impedance of the filter is only about 0·188 ohms, and this impedance is most probably less than the extension leads and is a negligible loss.

[over



As explained in the text, G2LP found that this arrangement was a complete cure for transmitter RF picked up by neighbours on their extension LS leads. The bi-filar winding consists of 50 + 50 turns and the condensers are .01 μF mica. If the amplifier shows a tendency to oscillate, C1 can be omitted.

Comment on Hi/Fi Amplifiers

Finally, as regards most of today's Hi/Fi amplifiers, the trend is to have one good receiver with a number of loud speakers distributed about the house. This is a sound scheme (in more ways than one) and a logical one, too.

However, though one sees excellent frequency response curves published for amplifiers, we are often not told what happens beyond, say, some 30 kc. For instance, how the amplifier would perform when a signal of 100 kc, or 1 mc, or 10 mc is added to the input at various levels? What intermodulation, distortion and rectification effects occur? Although these higher frequencies must be taken into account in the negative feed-back circuit, there is a disadvantage in the standard arrangement today in that the extension LS leads are obviously permitted to act as an aerial. Under some conditions of use, an amplifier can even pick-up ignition interference and lead one to believe that the FM tuner is at fault!

Incidentally, a Hi/Fi amplifier employing this form of feed-back might be tricky to use as a modulator, particularly if the output leads are more than a few feet long. It could probably not be used for this purpose at all without a filter.

ROYAL NAVAL AMATEUR RADIO SOCIETY

The inaugural meeting of the Royal Naval Amateur Radio Society was held at H.M. Signal School, H.M.S. "Mercury," Leydene, Petersfield, Hants., on June 25. Those present at the meeting included: G3ENI, G3IPV, G3MRC, G3LIK, G3KEL, G3JFF, G3HIS, G3LET, G3AWO, G3HLW, G3BQR, G3CED, G3ACP, G3FMN, G3JAF, G3JZV, G3CNO, G2DZT, G8IX, G8WC and G3ODJ. During this meeting the constitution and regulations of the Society were decided upon and a committee was elected, as follows: Chairman, G8IX; hon. secretary, G3JFF; treasurer, Lt. J. J. Riggs; with as committee members Commander A. J. R. Pegler, R.N. (G3ENI), G3HLW, and ex-G3DOT.

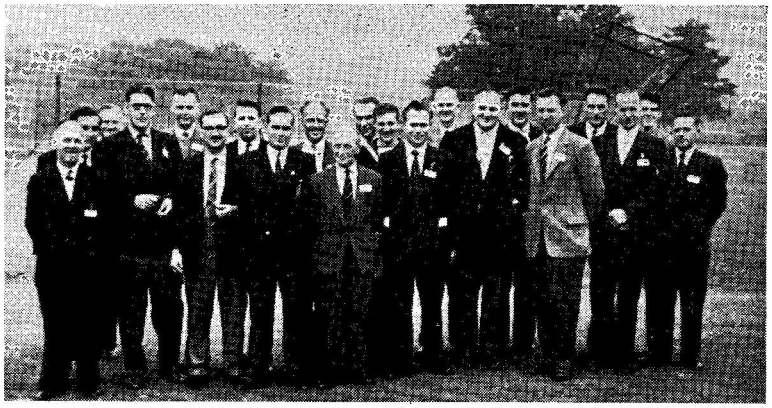
It was decided that three types of membership would be available in the Society; in corporate, associate, and junior grades. Subscriptions, which include membership certificate, and three copies of the *Communicator*, R.N. Signals magazine (issued at Easter, Summer and Christmas) are as follows: Corporate grade, 20s.; Associate grade, 15s.; and Junior grade, 10s. per annum.

The *Communicator* magazine will print some R.N.A.R.S. material, and a duplicated supplement will be provided, to Society members, when the occasion warrants it. It is hoped to start an R.N.A.R.S. Net going on 7 mc at regular intervals, and interested members are invited to look out for the Hq. station, G3BZU, on the amateur bands.

Persons eligible for membership should write to the Hon. Secretary, Royal Naval Amateur Radio Society, H.M.S. "Mercury," Leydene, Petersfield, Hants., for information and application forms.

BLASKET ISLAND DX-PEDITION

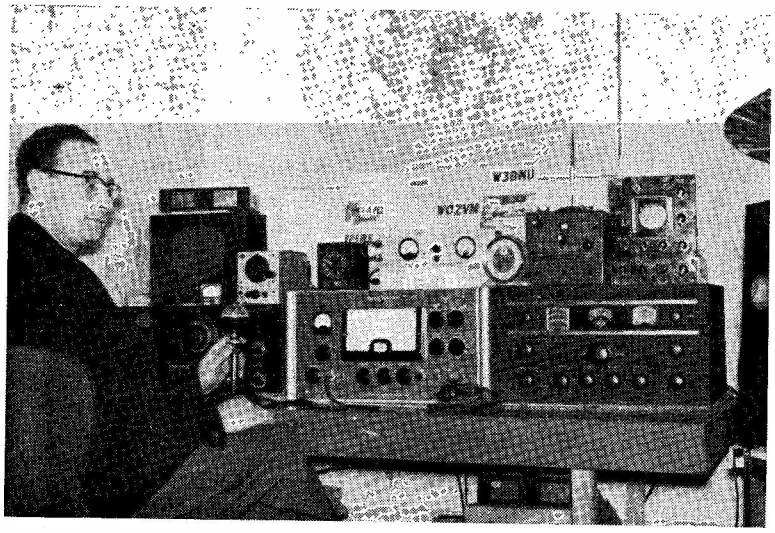
From the June issue of the I.R.T.S. publication *The News*, produced by EI6X, we gather that the EI expedition to the Great Blasket Isle last May, signing EIØAA, was at once a hilarious party and very successful radio-wise. The crossing from Dingle to Blasket Is., off the coast of Co. Kerry in south-west Eire, was made in a trawler, the *Elsie Mabel*. The expedition's generator and only source of power was dropped into the sea while landing, but after being recovered and cleaned out, it ran without a murmur. The gear—which included a DX-100U, a multi-band dipole and a Mosley V-4-6—had then to be carried up a 700 ft. hillside. A large quantity of general supplies had also to be taken, as the EIØAA team mustered 20 people all told, who had to be victualled for a week-end. The station was duly got on the air and by close-down on the Sunday, some 580 contacts in all continents had been logged on the 15-80 metre bands; radio conditions were not too good that week-end, and nothing could be done on Ten. But all concerned thoroughly enjoyed themselves—one of the highlights seems to have been the meals dished up from an extemporised cookhouse halfway up the mountain. The operators on EIØAA were EI2X, EI4AD, EI4R, EI6X, EI7BD and EI9V, assisted by ten SWL's and various characters who either played guitars, fished or skinned rabbits for the pot.



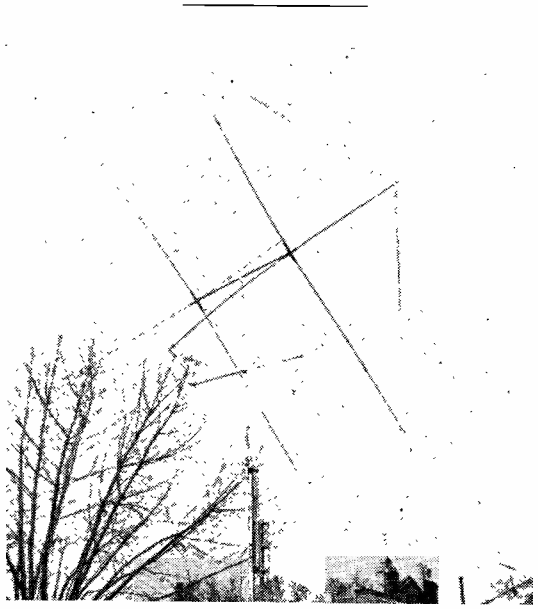
Group taken at the inaugural meeting of the Royal Naval Amateur Radio Society at the Signal School, H.M.S. "Mercury", Petersfield, on June 25. Identified, are, 4th from left in front row, G3JFF (hon. secretary), then G8IX (chairman), G3HLW, G3CED, G3ENI (pipe), and G3JAF. Those eligible to join R.N.A.R.S., which includes past and serving members of all ranks of the Royal Navy, Royal Marines, Women's Royal Naval Service, Naval Reserves and the Commonwealth Navies, are invited to apply for information to: The Hon. Secretary, Royal Naval Amateur Radio Society, H.M.S. "Mercury", Leydene, Petersfield, Hants.

THE OTHER MAN'S STATION

G3JZX



THE station shown here is owned and operated by H. G. Lassman at 268 Amhurst Road, Stoke Newington, London, N.16, who was licensed as G3JZX in October 1954. A start was made on Top Band and Eighty with input limited to 10 watts, as at that time G3JZX was on 240v. DC mains — in other words, he had plenty of milliamps. but no voltage! It was not till the early part of last year that the Stoke Newington district was changed over to AC, and it was then that the present station took shape.



Impression of the GM3BQA-type three-band Cubical Quad built by G3JZX. The array is rotated by a cowl-gill motor.

On the lower shelf, left to right, are the HRO Senior receiver, Acos crystal microphone, Morse key, AR88D receiver and a TV set; the transmitter, between the receivers, is a K.W. Vanguard, which covers all bands 10-160 metres, either phone or CW, and is self-contained for power. Auxiliary equipment, on the upper shelf, includes a Q5'er, SWR indicator, 80-ohm dummy load, and a Class-D Wavemeter.

The aerial is a Cubical Quad home-constructed to the GM3BQA pattern, using a single line 80-ohm feeder; it is carried on a 20-ft. steel lattice mast, which supports a 30 ft. 2 in. dural tube on which the beam itself is mounted; the assembly is rotated by an ex-Govt. cowl-gill motor, with remote control and beam direction indication taken back to the operating position. The Quad is a tri-band job for 10-15-20 metres, and for operation on 40-80-160 metres G3JZX has a 132-ft. end-fed wire which, though only 25 ft. high and under the beam, works quite well on the LF bands.

Activity at G3JZX is on all bands, using both CW and phone, and DX is worked as the opportunity presents itself. At the moment, WABC contacts are being accumulated. G3JZX's outside activities include membership of the Grafton Radio Society, the well-known North London club.

"JOINING THE MAGAZINE"

We occasionally have enquiries from casual readers who wish to know how they can obtain SHORT WAVE MAGAZINE regularly. The answer is either to place a regular order with a good local newsagent or send us a remittance for 33s., which ensures delivery of twelve issues by post monthly on the day of publication, in the U.K. The address is: Circulation Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. callsigns, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the U.K. section of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

G3MFQ/A, S. A. Kerrison, c/o "The Little Snail," Dodman, Norfolk.

G3OBZ, M. R. Birkett, 105 Surgeys Lane, Arnold, Notts.

G3ODO, W. Buckett, 125 Drift Road, Clanfield, Portsmouth, Hants.

G3OEH, R. N. White, 59 London Road, Marlborough, Wilts. *(Tel.: Marlborough 745.)*

G3OEO, Amateur Radio Society, c/o D. Westwood, Oxford College of Technology, Headington Road, Oxford.

G3OEQ, D. Bunn, No. 3 Flat, 2 High Street, Lowestoft, Suffolk.

G3OEW, D. L. Saunders, St. Briavels, Sutton Poyntz, Weymouth, Dorset.

G3OEX, M. G. Henstock, 58 Cassiobury Drive, Watford, Herts.

G3OFC, D. H. M. Reekie, 29 Spath Road, Didsbury, Manchester, 20, Lancs. *(Tel.: DIDsbury 2135.)*

G3OFN, S. J. Taylor, 6 Rosevean Road, Penzance, Cornwall.

G3OFO, N. A. Doe, 14 Forest Hill, Tilehurst, Reading, Berks.

G3OFQ, R. Lambert, 185 Hardhorn Road, Poulton-le-Fylde, Blackpool, Lancs. *(Tel.: Poulton 2854.)*

G3OFS, C. J. Swain, School House, High Street, West Malling, Maidstone, Kent.

G3OFS/A, C. J. Swain, St. John's School, Epsom Road, Leatherhead, Surrey.

CHANGE OF ADDRESS

G2BWP, H. W. Palmer, 22 Banky Meadow, Barming Heath, Maidstone, Kent. *(Tel.: Maidstone 86631.)*

G2DX, W. K. Alford, Dorndon, The Green, Yateley, Camberley, Surrey.

G3AFC, P. Beresford, 166 Coombefield Drive, Darenth, Dartford, Kent.

G3BRK, Aquila Amateur Radio Club, c/o R. C. B. Cutts, Signals Labs. I.B.I., E.I.D. Ministry of Aviation, Golf Road, Bromley, Kent.

G3CZZ, W. D. Old, 7 Trelawney Road, Camborne, Cornwall.

GI3FJX, J. Davidson, Cherrytrees, Plantation Road, Lisburn, Co. Antrim.

G3FYG, E. W. Edwards, 2 Newlands Lane, Culverstone, nr. Meopham, Kent. *(Tel.: Fairseat 503.)*

G3GBB, A. J. Munro *(ex-ZE5JU/DL2ZR/MP4BCO),* c/o Officers' Mess, R.A.F. Station, Swinderby, Lincs.

GI3HBO, D. E. Wilson, 28 Glenshane Park, Jordanstown, Newtownabbey, Co. Antrim.

G3IDA, D. J. A. Appleby, Reddynges, Back Lane, Croscombe, Wells, Somerset. *(Tel.: Shepton Mallet 2548.)*

G3INU, R. J. Appleby, 34 Benstede, Longmeadow, Stevenage, Herts.

G3JMZ, J. Hilton, Windsor House, Preston Road, Charnock Richard, nr. Chorley, Lancs.

G3KDK, H. R. Dean, 21 Hollybank Grove, Hayley Green, Halesowen, Worcs.

G3KWH, J. F. Vaux, 124 Parkway, Welwyn Garden City, Herts.

G3KXV, V. Johnston, 64 Bradhope Road, Berwick Hills, Middlesbrough, Yorkshire.

G3KZN, D. W. Blakeley, 35b Kings Grove, Peckham, London, S.E.15.

G3LAS, J. B. Butcher, 101 Austen Paths, Elm Green, Stevenage, Herts.

G3LCK, D. J. Bradford, 42 Mount Road, Canterbury, Kent.

GW3LXI, G. H. P. Price, 41 Main Street, Pembroke, Pembs., West Wales.

G3LYY, J. T. A. Johnston, 87a West Street, Ryde, Isle of Wight.

GM3MFE, D. W. Aird, 24 Academy Street, Alloa, Clackmannanshire.

AMENDMENTS

G3HMB, I. E. Elliot, 9 Dukes Wood Road, Longtown, Carlisle, Cumberland.

G3JCC, J. C. Cunningham, 15 Cranwell Road, Greasby, Upton, Wirral, Cheshire.

G3OEZ, G. Passmore, Dartmouth, Bridge Road, Bursledon, Southampton, Hants.

THIRD SCOUT RADIO JAMBOREE

We are asked to announce that the third international Scout Jamboree-on-the-Air will take place during the week-end October 21-23, midnight to midnight GMT. Any radio amateur with a past or present association with the Scout movement, or operating an AT station on behalf of a Scout unit, may take part. The general call "CQ Jamboree" will be used, on all amateur bands, and the operation of stations participating must be strictly in accordance with national regulations for AT stations. The Scout International Bureau will be on the air from Ottawa, signing VE3JAM on the following frequencies: 3750, 7100, 14175, 21250 and 28450 kc. The organiser for the U.K. is: L. R. Mitchell, G3BHK, Katoomba, Tyneham Close, Sandford, Wareham, Dorset, who will be glad to hear from G stations able to co-operate.

CHANGE OF ADDRESS FOR V.E.R.O.N.

We are asked to announce that though the office address for V.E.R.O.N., the Netherlands radio amateur organisation, has changed to P.O. Box 9, Amsterdam—C, the QTH for the QSL Bureau remains P.O. Box 400, Rotterdam; this has been the same for the last 30 years, incidentally.

THE MONTH WITH THE CLUBS

By *"Club Secretary"*

(Deadline for September issue: August 12)

(Address all reports for this feature to "Club Secretary")

REPORTS are unusually numerous, this month, bearing in mind the time of year, and it does seem that the Club movement as a whole is in a very flourishing state. It has been noted here that the new Clubs which appear from time to time usually survive the first critical months and eventually turn into a sound and permanent concern.

Not so six or seven years back, when Clubs used to arrive on our files in some numbers, only to languish there for evermore with only one entry against them.

The reason for the greater *continuity* of Club activities is very largely the popularity of mobileering, which naturally peaks in the summer months. We are even wondering whether a few organisations may not go into a slight decline when weather conditions force them to retreat to their Clubrooms and face a winter of indoor activity!

Certainly the mobile aspect has made for more contacts between Clubs, and between individual members of widely-dispersed Clubs, which is all to the good. We have just begun to think in terms of an inter-Club Mobile Contest (the summer equivalent of "MCC") but that, of course, will have to wait until next year. Meanwhile, any ideas on the subject will be more than welcome.

Bailleul, situated in Bailleul Camp, Arborfield, Berks, run Morse classes and R.A.E. instruction every Monday, Tuesday and Thursday. Visitors are welcome, also any licensed types from other camps in the district, who are offered the run of the clubroom, shack and aerial farm any evening. G3DXJ will also be glad to give his SSB lecture to other Clubs that have not yet heard it.

Barnet have an informal meeting on August 30, and their AGM on September 27. **Bradford** visited Broadcasting House, Leeds, on July 12, and on August 16 they, too, have an informal meeting, followed on September 6 by the first meeting of the new season—7.45 p.m. at 66 Little Horton Lane.

Crawley met on July 28 for a field day *post mortem* and they are also hoping to take part in the Two-metre Field Day. On August 11 they visit the S.E. Electricity Control Centre, and on August 25 G2AHL talks on Mobiles.

Crystal Palace meet on August 13 for a talk by G2FKZ on Crystal Oscillators. **Derby's** forthcoming big event is the Mobile Rally at Rykneld School, St. Albans Road, on August 14 (*see* also "The Mobile Scene" in this issue). August 10 is an Open Evening, also the 24th; on the 17th, a display of colour transparencies will be given.

Enfield did not meet in July, but on August 25 G3HJF will be talking about SSB, and on September 22 G2BVN will discuss selectivity devices. **Flintshire** are arranging a Picnic on the Central Beach, Prestatyn, at 2.30 p.m. on Sunday, August 14; next regular meeting will be on September 5, when G3ETH will talk about Co-axial Cable.

Harrow displayed amateur gear at the Gayton Fair on July 23, when they put G3EFX on the air. On the 15th they had a Junk Sale and on the 29th a talk by G3HBR on Portable and Field Day operation. Future meetings, Fridays at Roxeth Manor Secondary School, Eastcote Lane. August 12, Frequency Measurement; August 26, Recorded lecture. [over

SM5BMN (adjusting loop) and SM5MN visited British Timken (Northampton) Amateur Radio Club recently, and with her in this photograph are G3FWB (tuning receiver), and G3NOK (behind SM5BMN).

Isle of Wight Radio Society is newly formed, and will be operating a station from the exhibition of the I.o.W. Model Engineering Society, August 16-20. They will be on all bands, using the calls G3LYY/A, G3MAD/A and G3OCU/A. **Leeds** elected their officers and a fresh committee at their AGM in June, and the new season's programme is now being prepared. The first meeting will be at " Swarthmore " on September 21.

Liverpool had their usual four meetings during July, and also operated GB2LS from the Liverpool Show, July 14-16. Unfortunately, this information reached us far too late for last month's issue. **Mitcham** have booked a talk by G3JJG on SSB for September 23, and one by the Collins Radio Co. for November 18.

Purley will be hearing G3GKF on Transistors and their practical use on August 12, and Roger Kennedy on Radio Control on September 16. The Summer Fair was well supported by members, and their Club Net still goes strong on Sundays at 8 p.m. BST (160 metres).

Reading will be meeting on August 27 at the Palmers Hall, West Street. For the first half-hour (from 7 p.m.) G3GKH will be giving his usual Morse lesson, and this will be followed by a lecture by G3GHE on Transmission Lines and Terminations.

Stratford-on-Avon is a newly-formed Club, reporting for the first time. Their president is G8TO, chairman F/Lt. W. B. K. Searle and secretary G3MDU. They expect soon to move into their own headquarters, thanks to the generosity of Mr. W. T. Bird, and the local branch of the T.A. has suggested a close liaison. They meet fortnightly, and full details are available from the secretary (*see* panel).

British Timken held their AGM and made no changes in officers. They are discussing mobile operation and possibly a Mobile Rally for the future, and they will be operating G3NIB from the British Timken Show on August 26 and 27, when visitors will be welcome.

Halifax have recently had a lecture on Workshop Practice and a discussion on the arrangements for the Halifax Agricultural Show, at which they will be active with G3MDW/A on the air. August 16—Informal Meeting; August 30—Printed Circuits (G3JKD); September 6, Recorded Talk.

Greenford will have a demonstration of Fault-Finding, by G3IZW and G3MMQ, on August 16; on August 30 the event will be a Junk Sale. September 13 is Beginners' Evening, and September 27 is booked for " How's Your Band? "

Cheltenham continue their weekly meetings (Wednesdays at 8 p.m.) and they note a welcome increase in membership during the past few months. Sunday rag-chews continue on Top Band, from 0900 GMT onwards, and the net is open to anyone who can get in! G3GPW, the Club station, has been very active on *One-Sixty* before the meetings and at other times.

Blackwood (Mon.) have just formed a Club, and their inaugural meeting was attended by 20 members, and there are more who were unable to attend but have promised support. They will be meeting every Friday, 7 p.m. at the Church Hall, Hall Street, with G6BK as chairman (who was an active member when the Blackwood group first formed, some 30 years ago!) and GW3MMU secretary.

The **International Ham-Hop Club** now run a *daily* net—7100 kc phone at 1200 GMT and 7020 kc CW at 1800 GMT. Offers of hospitality are invited for ZS1IR and his XYL, September 15-30—either *via* the net or direct to G3CED.

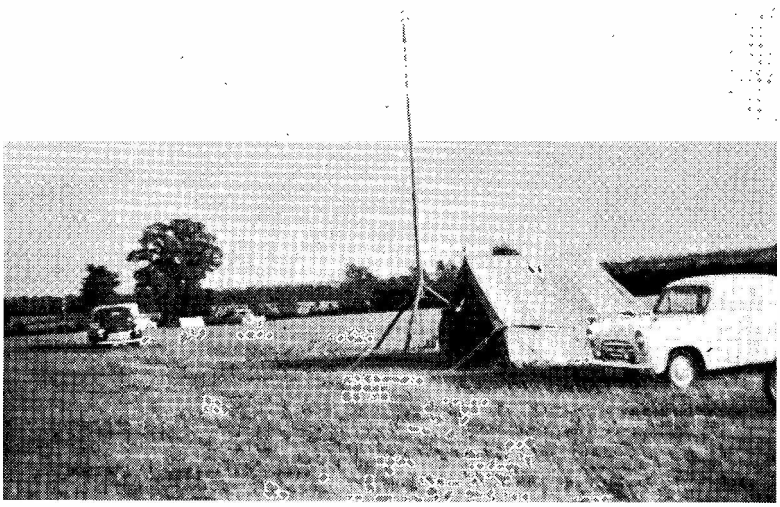
Newbury met on July 15 to hear about Present-Day Trends in Receiver Design; on August 26 there will be a recorded talk on D/F. And on August 21 the Club Jamboree will be held on Stroud Green; nothing organised, but all are invited to come when they like and do what they like.

Southgate will be taking part in the Friern Barnet Summer Show on August 19 and 20, where they will be showing three operational stations working all bands from Ten to One-Sixty. Turn up and sign the visitors' book!

Sutton and Cheam, who meet on the third Tuesday at The Harrow, High Street, Cheam, duly assembled on July 19 for

FIELD DAY AT HIGH WYCOMBE

The Chiltern Amateur Radio Club will be operating GB3HWS from the High Wycombe Show on September 3. All bands will be worked, and contacts will be QSL'd by a special card.



Typical scene at many a field-day site — the Wolverton Group had two stations out, near Bradwell in North Bucks., signing G3LCS/P and G3IYX/P (foreground).

a talk on Transistor Power Supplies and an Approach to Two-Metre Work, by G8DF. There is no meeting in August, but a Junk Sale will be organised for the near future. A stage-by-stage approach to SSB is also being covered in a series of talks.

Hastings scored a record of some kind on July 10 when G3MQT, their secretary, attended the South Shields Mobile Rally and collected the prize for the visitor from the greatest distance. The whole return journey was done within the 24 hours of Sunday, July 10, and he arrived before the talk-in station had been installed or the ground properly prepared! On the same day their president, G6QB, and treasurer, G3BDQ, performed the less strenuous function of attending the Worthing Bucket-and-Spade Party. August meetings are on the 16th and 30th, at 33 Cambridge Road, Hastings.

The field day station of the Crawley Amateur Radio Club, G8FR/P, in action with, from left to right, G8FR, G3JKF (nearest) and G3NIQ (far right). They made 195 contacts on what was their first field-day outing.

Aberdeen have a Junk Sale on August 5, a Rag-Chew on the 12th, a talk on VHF RF Technique (Part 2) on the 19th, and a talk by GM5YK on Triodes *versus* Tetrodes on the 26th—all meetings at 6 Blenheim Lane, 7.30 p.m.

Acton, Brentford & Chiswick meet on August 16 for a general discussion on members' problems and the Club's participation in future contests. Meeting at 66 High Road, Chiswick, as usual.

Cannock Chase recently had a talk on Getting Started on Two Metres, by G3BA and G3EJO. They now have 36 members, spread as far apart as Stone and Leicester. G3ABG and G4CP were able to give an optimistic report on field day results.

Civil Service Radio Society have their next meeting at the Science Museum on September 6, when there will be a talk on Radio Astronomy. Visitors and prospective members will be welcome on notification to G3JUL at the Museum (*KENsington 6371*). Informal meetings are held on the third Tuesday, when GB2SM is operated by Club members.

Grafton report another very successful local field day on June 18/19, when they operated, as usual, from Hampstead Heath. The Club is now closed until September 2, when it is hoped to have the new transmitter and a beam aerial in operation.

Lancaster have decided to change their name to **Morecambe,** and will meet on the first Wednesday at 125 Regent Road, Morecambe, when visitors will be made welcome. The same secretary carries on.

Reigate operated G3NKS/A and G3NKT/A from the Fuller's Earth Union Fete on July 9. They are organising a competition for the best piece of home-made gear, in two classes—Senior and Junior (for SWL's under 18). There will be an informal meeting at The Tower, Redhill, on August 20; later activities will include a Junk Sale, a visit to the BBC at Tatsfield and another to Gatwick Airport.

Wolverhampton meet at their Hq. (Nechells Cottage, Stockwell Road, Tettenhall) on August 15 for a talk and demonstration on Stereo. This is the only meeting arranged until the AGM on September 19. Their secretary is unfortunately indisposed, but an acting secretary has been appointed (*see* panel).

Cornish gathered at Redruth for their July meeting, with 24 present. G2BHW gave a field day report and followed up with a description of the birdcage and tri-band Quad aerials. Question-time brought up a variety of subjects.

The **Peterborough** event at Hunstanton on July 3 was very successful, in spite of there being another mobile rally in East Anglia on that same day.

The programme for **Wirral** during the next two months includes a lecture on Two Metres, by G3BOC, on August 5 and, on August 19, what should be a particularly interesting talk, by G3GST, on The Blind Person's Approach to Amateur Radio. The meeting on September 2 will discuss Stereo, initiated by G8BM; on the 16th of next month the meeting will be devoted to a field day inquest, presumably followed by a *post mortem!* From the Wirral *Newsletter* we gather that the Club expedition into

FRIERN BARNET SUMMER SHOW

GB3SRA (Southgate, Finchley & District) will be in action at the above event on August 19 and 20, the site being in the N.20 postal district. At least one station will operate throughout the Friday night. All bands, Ten to One-Sixty, and a special QSL card for all contacts.

Wales was a great success and a most enjoyable trip for those who took part; they had 187 contacts on Top Band and 20 on two metres, from the counties of Radnor and Brecon.

Slade are visiting Airmec Ltd. at their Birmingham office on August 12; and on the 26th they will be discussing the future of the Club Station, and D/F contests. They hold the second part of their own Harcourt Trophy D/F Test on August 21.

South Yorkshire held a General Meeting in July to evaluate their first six months of activity. They will meet in future on the second and fourth Thursdays at the Stag Inn, Dockin Hill Road, Doncaster, and on August 11 they will be discussing future policy. August 25 will be an informal meeting.

Names and Addresses of Club Secretaries reporting in this issue:

ABERDEEN: W. K. Heggie, GM3NHW, 80 Leslie Terrace, Aberdeen.
ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London, W.3.
BARNET: D. K. Robinson, 3 Castle Road, London, N.12.
BLACKWOOD: P. M. Fulton, GW3MMU, 36 Sunnybank Road, Blackwood, Mon.
BRADFORD: M. Powell, G3NNO, 28 Gledhow Avenue, Roundhay, Leeds 8.
BRITISH TIMKEN: D. G. Chatfield, G3JXU, 55 Bush Hill, Weston Favell, Northampton.
CANNOCK CHASE: P. J. Davis, G3NTU, 45 Broad Street, Bridgtown, Cannock.
CHELTENHAM: J. H. Moxey, G3MOE, 11 Westbury Road, Leckhampton, Cheltenham.
CHILTERN: R. Barton, 25 Hillside Road, Marlow, Bucks.
CIVIL SERVICE: G. Lloyd-Dalton, 2 Honister Heights, Purley, Surrey.
CORNISH: W. J. Gilbert, 7 Poltair Road, Penryn.
CRAWLEY: R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley.
CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.
DERBY: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.
ENFIELD: V. Croucher, G3AFY, 15 Nelson Road, London, N.15.
FLINTSHIRE: J. Thornton Lawrence, GW3JGA, Perranporth, East Avenue, Prestatyn.
GRAFTON: A. W. H. Wennell, G2CJN, 145 Uxendon Hill Road, Wembley Park, Middx.
GREENFORD: E. Gray, G3CPS, 111 Ravenor Park Road, Greenford.
HALIFAX: A. Robinson, G3MDW, 7 Upper Brockholes, Ogden, Halifax.
HARROW: S. C. J. Phillips, 131 Belmont Road, Harrow Weald.
HASTINGS: W. E. Thompson, G3MQT, 8 Coventry Road, St. Leonards-on-Sea.
INTERNATIONAL HAM-HOP CLUB: M. Allenden, G3LTZ, 16 Grovefield Avenue, Frimley, Aldershot.
ISLE OF WIGHT: E. E. Westmore, 10 Alvington Road, Carisbrooke, I.O.W.
LEEDS: D. Dinsdale, 69 Spen Road, Leeds 16.
LIVERPOOL: H. James, G3MCN, 448 East Prescot Road, Liverpool 14.
MITCHAM: M. Pharaoh, G3LCH, 1 Madeira Road, Mitcham.
MORECAMBE: A. R. Thompson, G2FCL, 20 Brendjean Road, Morecambe.
NEWBURY: J. A. Gale, G3LLK, Wild Hedges, Crookham Common, Newbury.
PETERBOROUGH: D. Bryne, G3KPO, Jersey House, Eye, Peterborough.
PURLEY: E. R. Honeywood, G3GKF, 105 Whytecliffe Road, Purley.
R.A.I.B.C.: W. E. Harris, G3DPH, 4 Glanville Place, Kesgrave, Ipswich.
READING: R. G. Nash, G3EJA, 9 Holybrook Road, Reading.
REIGATE: F. D. Thom, G3NKT, 12 Willow Road, Redhill.
SLADE: C. N. Smart, 110 Woolmore Road, Birmingham 23.
SOUTH BIRMINGHAM: J. Bratby, G3GVA (no address given).
SOUTHGATE, FINCHLEY & DISTRICT: A. G. Edwards, G3MBL, 244 Ballards Lane, London, N.12.
SOUTH YORKSHIRE: W. Farrar, G3ESP, 2 Highbury Avenue, Bessacarr, Doncaster.
STRATFORD-ON-AVON: R. G. J. Hewitt, G3MDU, 18 Stratford Road, Warwick.
SUTTON & CHEAM: F. J. Harris, G2BOF, 143 Collingwood Road, Sutton.
WIRRAL: A. Seed, G3FOO, 31 Withert Avenue, Bebington, Wirral, Cheshire.
WOLVERHAMPTON: E. Brindley, 1 Pool Hall Road, Castlecroft, Wolverhampton.

WOODFORD-LOUGHTON AREA

It is boped to form a Club in the Loughton-Woodford area of Essex. Will all those who are interested in this project please contact Mr. A. H. Walker at 33 Eastwood Road, South Woodford, E.18.

CLUB PUBLICATIONS

We acknowledge, with thanks, the following Club Publications: **Cornish** (The New Link); **Crystal Palace** (Newsletter No. 53); **Enfield** (Newsletter Vol. 12 No. 3); **Hastings** (Natter-Net Notes No. 9); **Mitcham** (Newsletter July 1960); **Purley** (Newsletter July 1960); **R.A.I.B.C.** (Radial Vol. 6 Nos. 4 and 5); **South Birmingham** (Newsletter); **Newbury** (Nadars Newsletter No. 21); **Southgate and Finchley** (Newsletter July); **Wolverhampton** (News-Sheet July); **Wirral** (Newsletter Vol. 13 Nos. 3 and 4).

NEW STC SILICON RECTIFIERS

A new SenTerCel rectifier for the television industry has now been introduced by Standard Telephones and Cables Limited, and may well oust the valve and the selenium rectifier from the HT supply circuits of all TV receivers. Known as the SenTerCel type FST1/4, the new unit is a silicon semi-conductor type with remarkable properties which make it especially suitable for compact equipment, such as TV receivers incorporating 110° tubes. The 110° television tube makes possible a much smaller cabinet size than did the previous 70° and 90° tubes and, while the number of valves remains the same, the ambient temperature inside the new cabinets is substantially higher than before. In addition, the extensive use of printed wiring has reduced the mass of chassis metal available for heat absorption. Valve rectifiers, while suffering little in themselves from the higher temperature, contribute in no small degree to raising the ambient temperature, to the detriment of other components.

Selenium rectifiers have given excellent service in receivers in the past, being notable for their low heat dissipation, long life, robust construction and low volt-drop. The nature of selenium, however, is such that its operating current must be restricted considerably at high ambient temperatures. For instance, a typical selenium rectifier has a reduction of current rating of 50% at 55°C., compared with its rating at 40°C.

The new FST1/4 silicon rectifier, two of which are necessary on 200/240v. mains, has the following points in its favour:

(a). Its normal maximum current rating is 500 mA, as against 300 mA for most valve and selenium rectifiers. This reserve of HT can be useful where colour TV or extra refinements are contemplated.

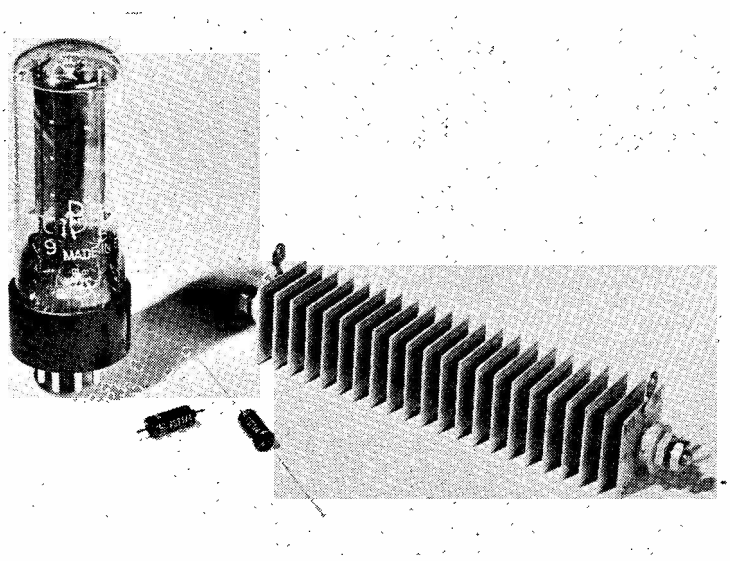
(b). Its performance at high ambient tem-

peratures is better than that of a comparable selenium unit.

(c). The voltage dropped in a series pair of FST1/4 diodes operated in a 200/250v. AC half-wave circuit is only one-sixth of that of a valve. Its heat dissipation is thus very small indeed.

(d). Its size and weight are but a fraction of the size and weight of a comparable valve or selenium rectifier. Thus more space is saved inside the cabinet.

The manufacture of the high-purity silicon used in the FST1/4 is by the "Silane" process, which was developed by Standard Telecommunication Laboratories, now also at Harlow. The multi-crystalline silicon obtained from the "Silane" equipment is converted into correctly-doped single crystals. The single crystal material is then cut into slices and polished to a controlled thickness in readiness for further processing, in which boron and phosphorous are diffused into the silicon, producing the required rectifying junction.



A pair of S.T.C. FST1/4 silicon diodes compared for size with the usual rectifying devices.

After plating to provide solderable electrodes, the silicon slice is sawn up into small "dice," each containing a rectifying junction. The dice are then soldered individually between silver wires and passed through etching baths, in an inert gas atmosphere.

SMALL ADVERTISEMENTS

(" SITUATIONS " AND " TRADE ")

9d. per word, minimum charge 12/-. No series discount: all charges payable with order. Insertions of radio interest only accepted. Add 25% for Bold Face (Heavy Type). No responsibility accepted for errors. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, S.W.1.

SITUATIONS VACANT

YOUTH required with Amateur Radio knowledge for shop dealing in ham equipment and Government surplus test equipment.—Apply by letter to: Universal Electronics, 22-27 Lisle Street, Leicester Square, London, W.C.2, or telephone *GERrard 4447* for further details.—Please state experience if any.

TRADE

QSL'S and Logs by Minerva. The best there are.—Samples from Minerva Press, 2 New Road, Brentwood, Essex.

WANTED FOR CASH: Good clean communication receivers and SSB equipment. Please state price. — Short Wave (Hull) Radio, 30/32 Princes Ave., Hull. *(Tel. 18953.)*

QSL CARDS AND LOG BOOKS, G.P.O. APPROVED. CHEAPEST, BEST. PROMPT DELIVERY. SAMPLES. — ATKINSON BROS., PRINTERS, LOOE, CORNWALL.

6AK5 VALVES, individually tested, perfect, 3s. 6d. each; 6AL5 *ditto*, 2s. 6d. each; 6AC7M, soiled, but perfect, 2s. each; c.w.o., post 6d. per valve. Also super Aeraxial co-ax, 1s. 7d. yd.; Aeraxial co-ax, 70-ohm, 9d. yd., p/p 1s. 6d. Woden Transformers, etc., Aerial Components, etc., Belling-Lee co-ax Plugs, Sockets, Line Couplings, etc., new Valves and CR Tubes, etc. Let us know your requirements (s.a.e. with enquiries, please).—R. J. Newey (Electronics), 23 Lea-House Road, Oldbury, B'ham.

MINIBEAM, £10. Millen Phase Networks, £5 each, complete. SCR-522 with AC power unit, £20. Heathkit GDO kit, £8. LG.300, £40. B. & W. TR switch, £10. P58 Receiver, £10. HRO Junior, 175 kc IF, £10. Type 78 coax relays, new, £1. 182 indicators, new, £1. 10X crystals, 7s. 6d. each, etc.—Marine Aeronautics, Ltd., 119 High Street, Teddington, Middlesex. *(TED. 1664.)*

READERS' ADVERTISEMENTS

3d. per word, min. charge 5/-, payable with order. Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 1/6 extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, S.W.1.

RELAYS Carpenter's 5C9, 5C9B, 12s. 6d.; 680-ohm 12/24-volt, sealed, 4P CO, 8s. 6d.; 700-ohm 12/24 volt lightweight, 2P CO, 10s.; P.O. 3000 500-ohm 3P CO, 4s. 6d. Miniature preset pots: 1K, 5K, 10K, 50K, 100K, 1M, 2s. Valves: EC91, 3s.; EAC91, 2s. 6d.; 6F33, ECC91, 2C26A, 2s.; EB91, 1s. 6d. Motor-driven condensers, 40-40 $\mu\mu$F, 12s. 6d.; ditto tuned lines, 3in., 11s. (both for 12 volts with ganged pot). Motors 12/24-volt, 10s. B7G valveholders, PTFE, 2s., or 18s. dozen; 28-way p & s, 3s. All ex-modern equipment, cleaned-up and guaranteed OK; p/p 6d. per item for orders below 7s. 6d.—Box No. 2300, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: Minimitter Transmitter, "Mercury" preferred; must be in first-class condition.—Write full details to Box No. 2295, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

RBC-1 equip. Rx CRV-46148, information req'd or manual.—GI3HBO, 28 Glenshane Park, Jordanstown, Newtown Abbey, Co. Antrim.

MARCONI CR-100 Receiver, mint condition (not ex-Govt. surplus), complete with manual, £20. —38 Ash Close, Dogsthorpe, Peterborough, Northants.

FOR SALE: K.W. Vanguard Tx, 10-80 metres, only 3 months' old, mint condition, perfect working order, complete with built-in K.W. Low Pass T/V Filter, £40; carriage paid, passenger train. No offers; owner going QRT.—Box No. 2297 (Scotland), 55 Victoria Street, London, S.W.1.

SALE: CRI Tx/Rx, all accessories, spare valves, unmodified, mint condition. Offers? — G2FSJ, 67 Wolversdene Road, Andover, Hants.

AMERICAN Model DX-100 Tx, with auto-transformer, £65. AR88D with S-meter, £45. Buyers collect. WANTED: GDO, calibrated up to 30 mc (Lancs.).—Box No. 2298, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: 15/20-watt, 80-160m. CW/Phone Tx, AC p/pack, £10; 600v. 250 mA p/pack, good design, £4 10s. Two-metre Cascode CC converter, IF 15·5-17·5 mc, £3 10s.; 813, plus base, 25s.; six-inch CRT and EHT pack, 25s.—Ruddock, 85 Grand Drive, Raynes Park, London, S.W.20. *(LIB. 4572,* evenings only, after 6.30 p.m., from 17th August).

FOR SALE: Labgear WBM unit, 45s. WANTED: HRO B/Spread Coil for 14 mc.—Box No. 2299, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Communications Receiver, late model preferred, but not essential if in good condition.—G8JO, 22 Pembroke Terrace, South Shields, Co. Durham.

ELMAC AF67, compact 50w. six-band Tx, VFO or Xtal, AM, CW, NBFM, instruction book, needs power pack, £35 o.n.o.?—Pye, 1 Monk Moors, Bootle Station, Cumberland.

OFFERS, PLEASE, for brand-new AR28/ARC5 100-150 mc Rx. Quantity of unused 813, QVO6/20, QVO6/40, 6AK5, 5763, etc.; other items; s.a.e. for list.—Box No. 2301, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HRO, modified RF plus NL, 4 coils, £10 o.n.o.? BC221, £15.—G3NTG, Officers' Mess, R.A.F., Bridgnorth, Salop.

2-METRE Equipment wanted: Converter, Tx, beam; prepared to pay fair price for good equipment.—Box No. 2302, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

COLLINS Rx, 1·2-12 mc, noise limiter; nearest £9 secures. — View after 6 p.m. weekdays at: G3NEF, 95 York Road, Southend.

BRAND-NEW RK75 valves for Tx or modulator, 4s. each. Also QVO4/7, excellent for two metres, 6s. each, or four for £1. — Jeapes, 165 Cambridge Road, Great Shelford, Cambridge.

NEW LG300, 1200v. p/pack, 100-watt mod., with spare 813 and filter, £50; 160m. Command Tx and p/pack, £6. Delivered 50 miles.—D. Jackson, G3LVZ, 11 Back Lane, Sileby, Loughborough, Leics.

WANTED: Ceramic wave-change switch or wafers; also cabinet AR77E.—G2BFT, 386 Lugtrout Lane, Solihull, Warwickshire.

SMALL ADVERTISEMENTS, READERS—*continued*

B2 Tx/Rx, p/pack complete, Tx unused, excellent condition, £15 o.n.o.? Philips 2½in. Kathegraph II 'scope. Offers? — Whitehead, 29 Canberra Crescent, Hemswell, Lincolnshire.

SALE: HRO Senior, complete, unmodified, mint condition, table model, with instruction manual, £20. BC-348 double-superhet, bandspread 160 to 15 metres, power pack, etc., £20.—Box No. 2303, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

AR88D, £37 10s., SX28, £27 10s.; both with manuals. American Mobile Tx 10/160, £45. Cossor DB 'Scope, £15. Webster Wire Recorder, £10. Transistor Tape Recorder, £15 ; 1200ft. tape, 20s. 1000v. Transformer, 20s. Bulle Battery Clock, 60s. R.C.A. Modulator, £8. Valves: 866A, 10s.; 805, 15s.; 6SG7, metal, 7s. Bendix mod. power unit, pair 807, £3. 7/75 $\mu\mu$F compression ceramic condensers, 1s., 10s. doz. H.D. Santon rotary switches same price. ·01/1000v. condensers, 3s. doz. 12v. mobile power pack, 10s. 200 mA meters, 6s. 6d. 4in. Planer, £6 10s. Compressor, £3. All plus carriage. Stamp inquiries, please.—Box No. 2304, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

MINIMITTER Tx, perfect order, £45. Also Minimitter 5-band converter, same condition, £10.—G3BHT, Sandy Lane, Hightown, Nr. Liverpool. *(Tel. Hightown 182.)*

SALE: W/S No. 62, 1·7-10 mc Tx/Rx, ideal /P & /M, complete with mike, phones, key and handbook, excellent, £16. PC.R2, exc., with built-in p/pack, £6. Minimitter Q-Multiplier, as new, £4.—Box No. 2306, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: *Modern Practical Radio and Television,* Vols. 1, 2, 3 and circuits data, by Caxton. Offers? —A. D. Tregale, G3LMT, 41 Normandy Road, Exeter.

CR-100 for sale, first-class condition ; noise limiter, S-meter, complete with new RCA speaker, £17 the lot ; buyer collects. — Morgan, 8 Austhorpe Avenue, Leeds, 15.

CLEARANCE, mainly new equipt.: Modulator, UM1 & UM3, magic eye, professional panel. Transformers, 750v., 650v., 350v., 6·3v., etc. New comprehensive p/pack assembled not wired. Host of valves and small components. State requirements and price offered, if possible. Reason: Gone commercial.—G3JPN, 24 Bloomfield Road, Birmingham, 13.

WANTED: PSU Input 240v., double smoothed output 600-750v., 300-400 mA, 6·3v. 5a. State size and weight. — GW3LSB, Pant Derw, Betws-y-Coed, Caerns.

WANTED URGENTLY: B2 Tx/Rx, complete, in original case, if possible, with p/pack, unmodified ; also £1 offered for B2 handbook.—M. Gee, 11 Whitehorse Lane, Stepney, London, E.1.

EDDYSTONE 888A, 1960, still in maker's carton, £90 or offers ; consider exchange for SSB Mobile gear. — GM3BQA, Edinburgh Road, Cockenzie. *(Port Seton 331.)*

TIGER 60B, Latest Model, 60w. Phone/CW, six bands *(see* Manufacturer's Advertisement, January/March 1960 *Short Wave Magazine).* Five months old ; sale due anticipated removal September. Please write first to view, test or sked ; s.a.e. fullest details ; £70.—G3KGB, 15, Cell Farm Avenue, Old Windsor, Berks.

SMALL ADVERTISEMENTS, READERS—*continued*

CR-100, noise limiter, muting, low noise RF, matching speaker, spares, £18. 40-watt Tx, Vanguard parts and circuit, low pass filter, less outer case, £10. Buyer collects. — Duncan, 12 Ivanhoe Place, Dundee.

WANTED TO PURCHASE OR LOAN: Marconi CR-100 manual or circuit.—Please write: Frankie Aw, P.O. Box 2271, Singapore.

NEW Garrard Tape Deck, £15; Williamson Amplifier, £7 10s.; HRO, £10; SX25, £17 10s.; BC-348, £17 10s.; 12BH7 and 12AU7, 3s. 6d. Plus carriage; s.a.e. details.—G3IDW, 14 Cricklade Road, Swindon, Wilts.

SALE: Converter, output 1·6 mc, covers 175 kc to 40 mc, Denco coils, Eddystone dial, £3 R107 RF Unit, new valves, modified, £2.—D. E. Jones, 6 Talybont Road, Llanrwst, Denbighshire.

AR88D, in first-class condition, S-meter, phones, handbook; any trial; buyer collects; £45. MN26C, new, with control box, £4.—Box No. 2307, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

EDDYSTONE 840, good condition, £30.—G3COI, 65 Hurst Street, Birmingham, 5.

NEW EXPLORER 120-watt Tx, with frequency multiplier fault, otherwise mint condition, cost £100, offered at £50, or would consider Eddystone 750 or similar Rx in level exchange or cash either way.—G4GH, 3 Daltry Close, Liverpool, 12.

URGENTLY REQUIRED: Top Band or all-band Tx, complete P/CW/PSU O/P trans. R208, CR-100, S-meter.—Tunstill, 21 Chaucer Road, Chelmsford *(4967)*.

FOR SALE: R208 receiver, £6 10s. Buyer collects or pays carriage. — Farr, 2 Sunshine Cottages, Shottery, Stratford-on-Avon, Warwickshire.

LG.300 Mk. II, with companion power and modulator unit, mint condition, £90. SSB Tx, crystal filter generator, two 6146 final, 10/15/20 metres, fitted Imhofs 19-inch rack cabinet, £50; cost £85, plus labour. Any examination, greatest pleasure. —G3NMR, 95 Collingwood Gardens, Ilford, Essex.

MINIMITTER EXCITER (Miniciter), six valves, five bands, unused, £10. Seen after 7 p.m.—G5LY, 33 Downs Road, Langley, Bucks.

FOR SALE: AR88D, perfect condition, complete with Manual, trimming tools and newly fitted R.C.A. S-Meter, £52 10s., buyer collects. New AR88 spares: Dial window 10s.; 3 x 4 μF condenser pack, 12s. 6d.; gear train assembly, 35s.; genuine R.C.A. S-meter, 57s. 6d.; knobs, large 5s., medium 4s., small 3s.; other items available, send s.a.e. for list.—A. J. Reynolds, 139 Waller Road, London, S.E.14. (*Telephone New Cross 1443 after 7 p.m.*)

SALE: Mobile Rig—Minimitter Tx, Control Box, ARC5 Receiver, 2A Power Unit, 1·8 mc Mobile Whip, complete, £27. WANTED: Complete QRO 2-metre Tx (TVI-proof), also Mobile 2m. Tx. Valves 5763, QQVO6-40A, Rotator, etc., for G4ZU mast, S-meter AR88, Co-ax relays, chokes 250 mA. Deliver, collect 70 miles.—G3NZT, 794 Bury Road, Bolton. *(Phone 8046.)*

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: Correspondence course for R.A.E.—Box No. 2308, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: 7 mc xtals, B76 type. Also R1155 (trawler band model?) preferably working. Must be cheap.—J. Marshall, Gomersal Vicarage, Leeds.

WANTED: R208 in good condition, complete with power.—D. Evans, Leas House, Kingsley Way, London, N.2.

FOR SALE, Brand new and unused: National NC109, 0·54 to 40 mc, £65; Heathkit VF1U, £5; Heathkit DX-40U, £23 (factory built); Vibroplex bug, £5; Tiger Radio Z-Match Coupler. £5, 150-watt 10-80 metres, used; BC-221 with internal power pack, £25.—E. T. Noakes, 55 Berwick Road, Little Sutton, Wirral, Ches.

WANTED: AR88D, must be in mint condition; also HRO bandspread coils, details and price to.—Carver, 7 Ethelbert Road, Folkestone, Kent.

EDDYSTONE 358X 1.2-30 mc, with p/pack, loudspeaker, and handbook, £10.—J. D. McCormack, 328 Garretts Green Lane, Birmingham, 33.

12 VOLT Dynamotors, output 250 volts 125 milliamps, 10s. each. 6-pin Jones plugs and sockets, 1s. 9d. pair; *ditto* miniature, 3s. pair, postage extra; s.a.e. list—G3JMU, 121 London Road North, Lowestoft.

G4ZU beam, Panda type, match box, coax, offers? Command transmitter BC-457, unused, 25s. *QST* 1952, bound volumes, 25s. All carriage extra.—Stevens, 51 Pettits Lane, Romford, Essex.

BC-221, perfect, charts, spare valves, handbook, phones. Quick sale, £15 plus carriage.—G3ISD, 3 Gore Court Road, Sittingbourne, Kent.

WANTED: BC-453, BC-458/9, 85 kc IF transformers.—Morris, Park View, Lichfield Road, Branston, Burton-on-Trent, Staffs.

WANTED: 1958 Model Eddystone S.750, with S-meter. Faulty models not considered.—Box No. 2309, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: CR-100, perfect, £20, any trial. LG.300, mod. and power supply, offers? — Norman, 59 Sunnyhill Road, Southbourne, Bournemouth.

WANTED: New condition Command Receiver BC-454, 3-6 mc. State price.—Box No. 2310, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

75A4 Collins Receiver, as new, £250.—Riverdale, 12 Manor Road, Teddington, Middlesex. *(Ring TED. 1664.)*

CR-100 Manual, good condition; buyer collects or pays carriage. Offers? — Mills, 19 Malmesbury Road, South Woodford, London, E.18.

SWOP Tape Recorder Collaro Mk. IV Deck, good reproduction, condx. fair, cost 60 gns.; three tapes; for communications Rx or other radio gear, W.H.Y.? — Box No. 2296, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

VALIANT TRANSMITTER, 10/80 metres, complete as new, £27; UM1, 30s.; Eddystone 10-metre converter, £2. — Ingram, 49 Lime Tree Avenue, Broadway, Worcestershire.

WANTED: Coils S/W, Denco, Eddystone, Miniature, and VHF plug-in; Eddystone condensers. SELL: Valves, 6d. to 3s. 6d.—D. Bowers, 24 Home Park Road, Saltash, Cornwall.

INTRODUCING TO YOU THE WORLD-FAMOUS

Heathkit DAYSTROM

Easy-to-build kit-sets of highest quality at lower cost

AMATEUR TRANSMITTER. Model DX-100U. Covers all amateur bands from 160-10 metres. Self-contained including power supply, modulator and V.F.O. ... **£78 10 0**

"HAM" TRANSMITTER. Model DX-40U. Compact and self-contained. From 80-10 m. Power input 75 w. C.W., 60 w. peak, C.C. phone. Output 40 w. to aerial. Provision for V.F.O. **£29 10 0**

VAR. FREQ. OSCILLATOR VF-1U. From 160-10 m. Ideal for our DX-40U and similar transmitters. (Price less valves £8/19/6) **£10 12 0**

6-TRANSISTOR PORTABLE. Model UXR-1. Pre-aligned I.F. transformers, printed circuit, 7 x 4 in. high-flux speaker. Real hide case **£15 18 6**

DUAL-WAVE TRANSISTOR RADIO UJR-1. This sensitive headphone set is a fine introduction to electronics for any youngster **£2 16 6**

RES.-CAP. BRIDGE. Model C-3U. Measures capacity 10 pF to 1,000 μF., resistance 100Ω to 5 MΩ and power factor. 5-450 v. test voltages. With safety switch **£7 19 6**

AUDIO SIGNAL GENERATOR. Model AG-9U. 10 c/s to 100 kc/s, switch selected. Distortion less than 0·1%. 10 v. sine wave output metered in volts and dB's **£19 3 0**

VALVE VOLTMETER. Model V-7A. Measures volts to 1,500 (D.C. and RMS) and 4,000 pk. to pk. Res. 0·1Ω to 1,000 MΩ. D.C. input imped. 11 MΩ. Complete with test prods, leads and standardising battery ... **£13 0 0**

R.F. PROBE. Model 309-CU. Extends the frequency range of our V-7A to 100 Mc/s and enables useful voltage indication to be obtained up to 300 Mc/s **£1 5 6**

5 in. OSCILLOSCOPE. Model O-12U. Has wide-band amplifiers, essential for TV servicing, F.M. alignment, etc. Vertical freq. response 3 c/s to over 5 Mc/s without extra switching. T/B covers 10 c/s to 500 kc/s in 5 ranges **£34 15 0**

ELECTRONIC SWITCH S-3U (Oscilloscope Trace Doubler). Enables a single beam oscilloscope to give simultaneous traces of two separate and independent signals. Switching rates approx. 150, 500, 1,500, 5,000 and 15,000 c/s. **£9 18 6**

CAPACITANCE METER CM-1U. Direct-reading 4½ in. scale. Full-scale ranges, 0-100$\mu\mu$F, 0-1,000$\mu\mu$F, 0-0·01μF and 0-0·1μF ... **£14 10 0**

AUDIO WATTMETER. Model AW-1U. Up to 25 w. continuous, 50 w. intermittent ... **£13 18 6**

CM-1U

S-33

USP-1

S-88

FM TUNER

S-3U

DX-100U

THE "GLOUCESTER" EQUIPMENT CABINET

HI-FI F.M. TUNER. Tuning range 88-108 Mc/s. For your convenience this is available in two units sold separately as follows: Tuner Unit (FMT-4U) with 10·7 Mc/s I.F. output (£3/2/- inc. P.T.). I.F. Amp. (FMA-4U) complete with cabinet and valves (£10/10/6). Total **£13 12 6**

HI-FI 16W STEREO AMPLIFIER. Model S-88, 10 mV. basic sensitivity (2 mV. available, 20/- extra). Ganged controls. Stero/Monaural gram., radio and tape recorder inputs. Push-button selection. Two-tone grey metal cabinet **£25 5 6**

6-W STEREO AMPLIFIER. Model S-33. 3 watts per channel, 0·3% distortion at 2·5 w/chnl., 20 dB N.F.D. Inputs for Radio (or Tape) and Gram., Stereo or Monaural, ganged controls. Sensitivity 100 mV.... ... **£11 8 0**

TRANSCRIPTION RECORD PLAYER RP-1U. 4-speed A.C. motor. Ronette Stereo/Mono pick-up. Complete with plinth. **£12 10 0**

HI-FI SPEAKER SYSTEM. Model SSU-1. Ducted-port bass reflex cabinet "in the white." Twin speakers. With legs (£11/12/6) **£10 5 6**

"GLOUCESTER" EQUIPMENT CABINET. 46⅛ x 30 x 21 in. deep. Mk. I houses: Record Player, Stereo Amplifier, F.M. Tuner, records, etc. Mk. II will house a Tape Deck in addition. Left in the white for finish to personal taste.
Mk. I ... **£15 18 6** Mk. II ... **£17 8 6**

"COTSWOLD" HI-FI SPEAKER SYSTEM KIT. Acoustically designed enclosure "in the white" 26 in. x 23 in. x 15½ in., housing a 12 in. bass speaker with 2 in. speech coil, elliptical middle speaker and pressure unit to cover the full frequency range of 30-20,000 c/s. Complete with speakers, cross-over unit, level control, etc., ... **£19 18 6**

COMPLETE MATCHED STEREO OUTFIT. Includes RP-1U record player, S33 amplifier and twin SSU-1 speaker systems. (Pedestal speaker legs optional £2/14/- extra)... ... ... **£42 10 0**

STEREO-HEAD BOOSTER USP-1. Input 2 mV to 20 mV. Output adjustable from 20 mV to 2 v. 40-20,000 c/s. Also suitable as high-gain monaural amplifier **£5 19 6**

AUDIO VALVE MILLIVOLTMETER AV-3U. 1 mV to 300 v. A.C. 10 c/s. to 400 kc/s **£13 18 6**

2¾" PORTABLE SERVICE 'SCOPE, OS-1. A compact, portable oscilloscope ideal for servicing and general laboratory work. Overall size 5" x 8" x 14¼" long, weight 10½ lbs. Y amplifier sensitivity 10 mV/cm, bandwidth 10 c/s, 2.5 Mc/s. Time base 15 c/s—150 Kc/s. Uses printed circuit board & 2¾" c.r.t. **£18 19 6**

Prices include free delivery U.K.
Deferred terms available on orders over £10.

Please send me FREE CATALOGUE (Yes/No)
Full details of model(s).....
.....
NAME.....
(BLOCK CAPITALS)
ADDRESS .....
..... SW8

DAYSTROM LIMITED

DEPT. SW8, GLOUCESTER, ENGLAND

A member of the Daystrom Group, manufacturers of the

WORLD'S LARGEST-SELLING ELECTRONIC KITS

Printed by The Courier Printing Co. Ltd., Tunbridge Wells for the Proprietors and Publishers, The Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1. The *Short Wave Magazine* is obtainable abroad through the following: Continental Publishers & Distributors, Ltd., William Dawson & Son, Ltd.; AUSTRALIA AND NEW ZEALAND — Gordon & Gotch, Ltd.; AMERICA—International News Company, 131 Varick Street, NEW YORK. Registered for transmission to Canada by Magazine Post. *August*, 1960.